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PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstracts Bulletin) is a monthly publication of the Management Support Division of the Office of Pesticides and Toxic Substances, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

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81-1201. Montosov, K. A. (Buriat Agric. Inst., Ulan-Ude, USSR) **Vliyanie gerbitsidov na urozhai i kachestvo sena estestvenno oroshaemogo luga. [Effect of herbicides on yield and quality of hay from naturally irrigated meadow.]** *Agrokhimiya* 12: 87-91; 1980 (6 references) (Russian).

Results of evaluation of the effect of the herbicides 2,4-dinitro-6-methylphenol (DNOC) and the amine salt of 2,4-D on the yield and quality of hay from a naturally irrigated meadow are reported. Herbicides were applied at rate 500-600 l/ha (1-4.8 kg/ha). Herbicides were found to change the species composition of the herbage, and thus the chemical composition of the hay. The decrease of hay protein and cellulose content was compensated for by application of mineral fertilizers.

81-1202. Anonymous **Unnecessary alarm on pesticides causes concern.** *Aust. Sugar. J.* 71(11): 565-578; 1980.

In a summary of an address to the Queensland Rural Press Club, the methods for determining human no-effect levels and maximum residue limits of pesticides from experimental animal data are outlined. No-effect levels are generally determined from extensive studies performed on several animal species to determine what level of pesticide intake does not affect the animals in any way. Human no-effect levels are then extrapolated from this data: usually 1% of the no-effect level of the most sensitive species. If human data are, or become, available, no-effect levels are based on them. The maximum residue limit (MRL) is then calculated to provide a level of safe, daily intake of the pesticide residue over an entire life span. If current application practices do not yield residues as high as the calculated MRL, the authorized MRL is then established at the residue level expected from normal practices.

81-1203. Anonymous **National Health and Medical Research Council 1978 finding on 2,4,5-T.** *Aust. Sugar. J.* 71(11): 578; 1980.

In 1978, the National Health and Medical Research Council of Australia thoroughly reviewed all information on the phenoxy herbicides 2,4-D and 2,4,5-T, as well as on TCDD, the contaminant found in 2,4,5-T formulations. The Council determined that there was no evidence linking 2,4-D use and adverse human health or human reproduction risks. It also determined that there was no substantiated scientific evidence of a causal relationship between 2,4,5-T and human birth defects. Reports of clusters of human birth defects related to 2,4,5-T use from Australia, the United States, New Zealand and in Vietnam veterans were examined before determining that no additional restrictions on 2,4,5-T use were unnecessary. The Council recommended that TCDD levels in 2,4,5-T be further reduced. After reviewing new information in 1979, the Council determined there was no scientific basis for imposing additional restrictions on 2,4,5-T use in Australia.

81-1204. Leigh, T. F.; Wynholds, P. F. (Dep. Entomol., US Cotton Res. Stn., Shafter, CA) **Organophosphorus insecticides stimulated egg laying of mites reared on the treated cotton plants.** *Calif. Agric.* 34(10): 14-15; 1980.

Cotton plants were treated 3 times at 2 wk intervals in greenhouse experiments with normal dosage rates of either methyl parathion, toxaphene + DDT, or dimethoate. After the third application, two-spotted mites were reared individually from egg to adult stages on treated plants. Control populations were reared on untreated plants. Treatment with methyl parathion or dimethoate did not affect egg hatch or the time of mite development. Treatments did significantly affect reproduction by spider mites. Significantly more sider mite eggs were produced on toxaphene + DDT treated plants than on the others, but the total of all stages did not significantly differ from controls. The results of the study suggest that spider mite outbreaks in cotton fields are not only caused by the killing of the natural predators of the mites, but also by the stimulation of mite reproduction in their early adult life.

81-1205. Birch, M. C.; Paine, T. D.; Miller, J. C. (Entomol. Dep., Univ. California, Davis, CA) **Effectiveness of pheromone mass-trapping of the smaller European elm bark beetle.** *Calif. Agric.* 35(1-2): 6-7; 1981.

A study of the effectiveness of pheromone mass-trapping to suppress populations of the smaller European elm bark beetle, *Scolytus multistriatus* (Marsham), was made in eastern California. Multilure was set out to bait traps in the towns of Big Pine, Independence, and Lone Pine. Trap catches in all 3 towns declined dramatically from 1976 to the end of 1977, but increased during 1978, and remained high in 1979. Evidence suggests that even with this amount of traps, the effect was one of monitoring the population rather than suppressing it. It was concluded that pheromone mass-trapping as a means of suppressing bettle populations was ineffective.

81-1206. Haynes, K. F.; Birch, M. C.; Klun, J. A. (Entomol. Dep. Univ. California, Davis, CA) **Sex pheromone offers promise for control of artichoke plume moth.** *Calif. Agric.* 35(1-2): 13-14; 1981.

A large amount of insecticides was used throughout the 1975-76 growing season in California to combat the artichoke plume moth. Some pesticide resistance developed in the insect as a result, and normal biological controls were disrupted. Through the introduction of integrated pest management practices, use of insecticides has diminished. Water traps using synthetic pheromones have been effective. The pheromone may be used in the future as a direct control treatment by the male confusion technique. Dispersion of the pheromone throughout the field would confuse the males so that they were be unable to locate virgin females and mate. However, the possibility of resistance development exists

and males may develop some other way of locating females.

81-1207. Schweizer, C.; Tarradellas, J. (Inst. Environ. Stud., Fed. Tech. Sch. Higher Learn., CH-1015 Lausanne-Ecublens, Switzerland) **Etat des recherches sur les biphenyles polychlores en Suisse. [Progress report on Swiss polychlorinated biphenyl research.]** *Chimia* 34(12): 509-519; 1980 (33 references) (French).

This study reviews the results of 10 yr of PCB research conducted in Switzerland on humans, lakes and rivers, sediments, birds and their eggs, sludges of waste treatment plants and food products. The levels of contamination were found to be of the same order of magnitude as those found in other highly industrialized countries. Levels in sludge were 7.6 ppm in Geneva, 8.5 ppm in Los Angeles, and 10 ppm in Amsterdam. Levels in fish were 910 ppb in Lake Geneva trout, 1800 ppb in Lake Superior trout, and 17-550 ppb in Baltic Salmon. Bird eggs from Switzerland, England and Sweden contained from 4.7 to 16.3 ppm. Levels in humans milk were 2.0 ppm/fat from Basel and 1.2 ppm/fat from Ontario. Analysis of fish contamination in lakes indicates that levels are rising. Great variations were found to exist between individual specimens of the same species, and contamination increased with age; current levels are distinctly higher than those found several years ago. It is recommended that Swiss PCB research be coordinated and nationally planned to find the sources of PCBs in the environment.

81-1208. Kadam, S. S.; Nerkar, Y. S.; Salunkhe, D. K. (Coll. Agric. Technol., Marathwada Agric. Univ., Parbhani, India) **Subtoxic effects of certain chemicals on food crops.** *Crit. Rev. Food Sci.* 14(1): 49-109; 1981 (250 references).

The effects of certain chemical treatments, when applied in minute quantities to plants or soil, on plant yield and plant carbohydrate, protein, vitamin, fat, and mineral contents, as well as on the retention of plant nutrients and their quality after harvest, are reviewed. Increases and decreases in plant growth yield after application of *s*-triazines, 2,4-D, 2,4,5-T, monuron, terbacil, propanil, trifuralin, DNOC, dinoseb, Alar (daminozide), DDT, Dimecron (phosphamidon), and Nemafos (thionazin) are listed and discussed. Also examined in detail were changes in plant nutrients and pigments due to foliar or soil applications of *s*-triazine herbicides, substituted urea herbicides, bromacil, chloramben, chlorfurenol, chlorthiamid, CCC, alachlor, maleic hydrazide, phenoxy acid herbicides, DDT, endrin, organophosphorus insecticides, fumigants, and fungicides. Retention of nutrients after harvest and interactions with 2,4-D, 2,4,5-T, Alar, Telone (D-D), Nemagon (DBCP), Randox (CDAA), Cycocel (CCC), and N^6-benzyladenine are also reviewed.

81-1209. Sarbhoy, R. K. (Cytogenet. Lab., Bot. Dep., Agra Coll., Agra 282002, India) **Effect of paradichlorobenzene on the somatic chromosomes and mitosis of *Lens esculenta* (L.) Moench.** *Cytologia* 45(3): 381-388; 1980 (41 references).

The effect of *p*-dichlorobenzene (PDB) was studied in the root tips of germinating lentil seeds. Several mitotic variations were noted when root tips of *Lens esculenta* var. *microsperma* were treated with PDB beyond 6 hr. PDB also produced a marked effect on the germination of seeds. The germination and growth of radicles were inversely proportional to the amount of PDB. Low dose treatments, 25-100 mg PDB, caused no visible effect at the early stages of germination. Doses of 750 mg to 1 g caused greatly retarded growth, and some mortality. Chromosomes in the resting stage, anaphase or telophase stages were not significantly effected. Various types of anomalies were noted in the morphology of chromosomes at metaphase. Precocious separation of the chromatids was also noted, along with fragmentation of chromosomes and chromatids. In certain cases the cells in early telophase stage showed chromosome bridges, which may have been formed due to the sticky nature of the chromosomes. Usually these bridges broke up, with the broken ends withdrawing into the resting nuclei. These findings emphasize the potentialities of PDB as a mutagenic chemical.

81-1210. Kenmore, P. E. (Univ. California, Berkeley, CA) **Ecology and outbreaks of a tropical insect pest of the green revolution, the rice brown planthopper, *Nilaparvata lugens* (Stal).** *Diss. Abstr. Int. B* 41(7): 2471; 1981.

The evolution of rice cultures from traditional varieties and poor water control to modern, high yielding varieties (HYV) dependent on irrigation, nitrogen fertilizers, and, supposedly, insecticides, greatly influenced the development of pest problems. Brown planthopper (BPH) is a pest that was aggravated by the green revolution. Prior work, strongly supported by this work, showed that some of the inputs recommended together with the new rice varieties, especially insecticides, caused massive outbreaks of BPH during the late 1960's and early 1970's across tropical Asia. These outbreaks occurred when BPH were released following insecticide use because the insecticides killed natural enemies of BPH but not the pest. Current pest control practices, illustrated with reference to Philippine farmers, aggravate the problem through use of low dosages of insecticides. In insecticide-free fields over 4 seasons the role of generalist spider and veliid predators and egg parasites of BPH were examined, as well as that of self-regulating density-dependent mechanisms affecting the fecundity and migration behavior of BPH populations. The numerical response of predators to BPH population density was clearly shown. More important, this work showed that in tropical insecticide-free rice fields BPH populations can be kept under economically damaging levels solely by natural enemies. The counter-productive cycle of crop loss-insecticide use is discussed from a

political, economic and social perspective, emphasizing farming village-level communities. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 8029448)

81-1211. Wilson, R. (Energy & Environ. Policy Cent., Harvard Univ., Cambridge, MA 02138) **Risk/benefit analysis for toxic chemicals.55** *Ecotoxicol. Environ. Saf.* 4(4): 370-383; 1980 (10 references).

The risks of toxic chemicals are discussed. A risk/risk evaluation is presented. The risks of chemicals, including pesticides, are compared to other, nonchemical risks, or to the risks of other chemicals. The problems of extrapolating animal data to man are discussed. The must severe problems are suggested to be synergistic activities. It is recommended that animal systems which do not allow for extrapolation to human systems not be used. Risks of industrial accidents and common daily life risks are described and quantified as a means of comparing risks of toxic chemicals. Assessment of public risk is also discussed.

81-1212. Tuchmann-Duplessis, H. (Lab. Embryol., Univ. Rene Descarte, F-75270 Paris, France) **The experimental approach to teratogenicity.** *Ecotoxicol. Environ. Saf.* 4(4): 422-433; 1980 (19 references).

Several aspects of teratogenic research are discussed. The action of a teratogen depends on the developmental stage of the embryo, the genetic susceptibility of the embryo and the physiological status of the mother. The influence of developmental stage on teratogenicity is discussed; genetic susceptibility and species differences, and Mendelian susceptibility and polygenic heredity are considered. An historical evaluation of experimental toxicology is given, including discussion of the pioneer period, the pre-thalidomide period, the post-thalidomide period and the present period. Evaluation of the influence of chemicals on postnatal behavior is recommended. Possible teratogens in the environment, including pesticides and herbicides, are discussed. The release of TCDD (dioxin) to the environment in an accident at Seveso, Italy, is considered. Experimental data on the teratogenicity of TCDD is presented. Humans are concluded to be less susceptible to TCDD than experimental animals. It is suggested that this differential toxicity may also occur for other teratogens, and may explain why few rodent teratogens have been found to induce human malformations.

81-1213. WHO, Geneva, Switzerland **Tin and organotin compounds: a preliminary review.** *Environ. Health Criteria* 15: 109 pp.; 1980 (391 references).

A preliminary review of the health aspects of tin and organotin compounds is presented. The 103 organotin compounds discussed are presented in tabular form; names used in the text, CAS Index names, CAS numbers, molecular formulae and synonyms are included for each compound. The chemistry and uses of inorganic tin and organotin compounds are summarized. Organotin compounds are used as agricultural fungicides, general biocides, bactericides and biostats, helminthicides in poultry, herbicides, rodent repellents, molluscicides, ovicides and miticides. Analytical methods available for determination of low concentrations of tin are reviewed. Environmental concentrations, environmental and occupational exposures, sources of environmental pollution, and environmental transport and transformations are discussed. The metabolism, effects on experimental animals, and effects in man of inorganic tin and organotin compounds is reviewed. Further studies of analytical methods, environmental data, metabolism, mechanism of action, and toxic effects are recommended.

81-1214. Hakanson, L. (Limnol. Surv., Natl. Swedish Environ. Prot. Board, S-75122 Uppsala, Sweden) **The quantitative impact of pH, bioproduction and Hg-contamination on the Hg-content of fish (pike).** *Environ. Pollut. Ser. B* 1(4): 285-304; 1980 (35 references).

Studies were conducted to establish the relationship between pH, trophic level (level of bioproduction), and mercury (Hg) contamination in fish. Literature on the Hg content of pike, the pH of the sediments of water bodies from which they were collected, and bioproduction was utilized. The bioproduction index (BPI) used is a function of ignition loss (IG), total-P and total-N. Values from published literature were used to derive to calculate the content of methylmercury in 1 kg of pike. The formula incorporated the weighted mean Hg content of surface sediments, the mean pH of the water system, and the BPI. The formula was tested on published data to determine its accuracy. The general validity of the formula was indicated by a correlation coefficient of 0.79 between the formula results and the published data. The formula is suggested for use in water quality management.

81-1215. Kriebel, D. (Cent. Biol. Nat. Syst., Queens Coll., Flushing, NY) **The dioxins: toxic and still troublesome.** *Environment* 23(1): 6-13; 1981 (55 references).

The dioxins are highly toxic synthetic pollutants occurring as contaminants in chlorinated phenols. Various cases of dioxin exposure to the environment are briefly noted. 2,3,7,8-TCDD is viewed as the most toxic, producing cancer and other serious disabilities in rats at 5 ppt. Dioxins have been distributed through the biosphere by various means, including the aerial broadcasting of dioxin-laden herbicides (2,4,5-T) on forests in the United States and on 6% of the land area of Vietnam. The burning of chlorophenol-treated lumber is reported to release dioxins, which are then carried off in the fumes and ashes. Fires in

sprayed forests and fields may also contribute dioxins to the environment. Accidents in the shipment of various chlorinated phenols used in the industrial activities of the nation also contribute to the spread of dioxins in the environment. Dioxins are not readily destroyed by many decomposition routes which are effective for other pollutants. Dioxins are broken down by photodecomposition, but only under specific conditions. Only 5 microbial strains have shown any ability to degrade 2,3,7,8-TCDD. The precise mechanism of TCDD toxicity is not known. TCDD can cause severe skin rash, changes in skin color, excessive hair growth, liver damage, and numbness and tingling in the arms and legs. Long term genetic effects in human have been suggested. Mutations in people exposed to TCDD have been reported in 2 studies. Three studies have linked birth defects to TCDD exposure. A recent study has demonstrated an increased risk of soft-tissue sarcoma among workers exposed to TCDD-containing chemicals.

81-1216. Aranda, G.; Berville, A.; Cassini, R.; Fetizon, M.; Poiret, B. (Lab. Syn. Org., Ec. Polytech., F-91128 Palaiseau, France) **Etude de l'hydrolyse et des proprietes toxiques vis-a-vis des mitochondries de mais Texas, d'un insecticide, le methomyl ou S-methyl-N {(methylcarbomyl) oxyl} thioacetimidate. [Study of hydrolysis and toxic properties towards Texas corn mitochondrias of an insecticide, methomyl.]** *Experientia* 37(2): 112-113; 1981 (11 references) (French).

The hydrolysis and toxic properties of methomyl on the mitochondria of corn with Texas cytoplasm were studied. Methomyl was found to be a specific poison of the mitochondria. Some carbamates obtained by structural modification of methomyl also exhibited this toxic property. Small quantities of thiomethyl methanesulfonate were found during the hydrolysis of methomyl in weakly acidified water. This metabolite was found to strongly inhibit plant cell mitochondria even at low concentrations (10^{-5} mol/l).

81-1217. IAEA, Vienna, Austria **Radiotracer studies of pesticide residues in edible oil seeds and related products.** *IAEA-218 Conf. Rep.* 7804117: 100 pp.; 1979.

A report is presented of a research coordination meeting organized by the Joint FAO/IAEA Division of Atomic Energy held in Vienna in 1978. Ongoing studies in developing countries on chemical residues in edible oils and related products are reviewed. Papers describing 10 research projects are included. The pesticides studied include carbaryl, hexachlorocyclohexane (BHC), organochlorine insecticides and leptophos. Recommendations for further action include improvement of the availability of isotopically labeled compounds for use in research, extension of collaboration for preparation of labeled pesticides and derivatives, study of deposition and disappearance of pesticides in milk and meat of dairy animals, and study of the nature and magnitude of bound pesticide residues in oil seeds. It is concluded that the contact between researchers in different countries and the FAO/IAEA Secretariat represents a significant contribution to country development, and that data obtained from the Agency's research contract program will be of value to institutions in the countries involved and to the Joint FAO/WHO pesticide residues program, which establishes international recommendations for maximum residue limits and acceptable daily intake. [Papers from this report will appear in appropriate sections of this issue of *Pesticides Abstracts.*]

81-1218. Santharam, G.; Balasubramanian, M. (Tamil Nadu Agric. Univ., Coimbatore, Tamil Nadu 641003, India) **Note on the control of *Spodoptera litura* Fabricius (Lepidoptera: Noctuidae) on tobacco with a nuclear polyhedrosis virus and diflubenzuron.** *Indian J. Agric. Sci.* 50(9): 726-727; 1980 (6 references).

Alternative control measures against *Spodoptera litura* Fabricus were tested for efficacy, and compared to usual chemical controls, in attempts to reduce residues of toxic chemicals on tobacco products. Nuclear polyhedrosis virus (NPV) was applied singly and in combination with chlorpyrifos and compared to single applications of diflubenzuron (a chitin inhibiting hormone analog), fenvalerate, dichlorvos and chlorpyrifos. At 250 larval equivalents (LE)/ha (15×10^{11} polyhedral inclusion bodies), NPV reduced *S. litura* populations by 86.39% at 7 days. Diflubenzuron (0.01%) reduced pest populations by 90.66% at 7 days. NPV + 0.04% chlorpyrifos reduced *S. litura* populations by 98.04% at 2 days. Fenvalerate and dichlorvos provided 100% and 96.16% control at 2 days. The results indicate NPV and diflubenzuron can be used for *S. litura* control with success comparable to other chemicals.

81-1219. Su., H. C. F.; Horvat, R. (Stored-Prod. Insects Res. & Dev. Lab., Agric. Res., SEA, USDA, Savannah, GA 31403) **Isolation, identification, and insecticidal properties of *Piper nigrum* amides.** *J. Agric. Food Chem.* 29(1): 115-118; 1981 (24 references).

Three amides were isolated from *Piper nigrum* L. (black pepper, an insect repellent) and identified from their spectral characteristics as (*E,E*)-*N*-(2-methylpropyl) -2,4-decadienamide (I), (*E,E,E*)-13-(1, 3-benzodioxol-5-yl)-*N*-(2-methylpropyl)-2,4,12- tridecatrienamide (II), and (*E,E,E*)-11-(1, 3-benzodioxol-5- yl) *N*-(methylpropyl) -2,4,10-undecatrienamide (III). The topical LD50 values of compounds I, II, and III against *Callosobruschu maculatus* (F.) were 2.18, 0.25 and 0.85 μg/insect for males (wt 3.8-5.7 mg) and 6.70, 1.43, and 3.88 μg/insect for females (wt 5.4-7.9 mg), respectively. (Author abstract reprinted by permission of the American Chemical Society)

81-1220. Witty, J. F.; Roughley, R. J.; Day, J. M. (Dep. Soil Microbiol., Rothamsted Exp. Stn., Harpenden, Hertfordshire AL5 2JQ, England) **Effect of plant spacing and soil application of aldicarb on nitrogen fixation by spring-sown field beans *Vicia faba L.*).** *J. Agric. Sci.* 94(1): 203-208; 1980 (13 references).

Field studies on the bean *Vicia faba* were designed to determine the effects of plant competition (plant spacing) and of soil application of aldicarb (a seedbed dressing of 10 kg/ha) on nitrogen fixation. Seeds were sown at 5 densities and at 6 different spacings, in 4 randomized blocks of 4.2 × 8.2 m plots. Two blocks received aldicarb. Plants were harvested at weekly intervals, and nodules assayed for nitrogenase activity. Number of pods, nodes with pods, and dry pod wt were also determined. Data showed that nitrogenase activity/plant decreased significantly with increased plant density, but this was compensated for, on an area basis, by increased numbers of plants. On an area basis, number of pods showed no significant response, and pod wt was not significantly affected by plant density. It was seen that alidcarb treatment consistently increased nitrogenase activity at all harvests. During this period, plots treated with aldicarb had twice the nitrogenous activity of untreated plots. The total dry wt of both vegetative matter and pods was consistently, but not significantly, higher on aldicarb-treated plots.

81-1221. Liu, L. C.; Acevedo Borrero, E. (Agric. Exp. Stn., Univ. Puerto Rico, Rio Piedras, PR) **Chemical weed control in taniers.** *J. Agric. Univ. P. R.* 64(4): 442-449; 1980 (7 references).

During experiments to determine the efficacy of the herbicides diphenamid, glyphosate, ametryne, linuron, nitrofen, metribuzin, fluometuron, cyanazine, DCPA, oryzalin and perfluidone for weed control for taniers (*Xanthosoma sagittifolium* L.) phytotoxicity was also monitored. Phytotoxicity measurements were based on a scale of 0 (not observed) to 100 (complete tanier plant kill). Both oryzalin + metribuzin, at rates of 1.12 kg/ha followed by metribuzin at 1.12 kg/ha, and fluometuron, at 4.48 kg/ha followed by 2.24 hg/kg, resulted in 2% phytotoxicity. Glyphosate, at all treatment regimens tested, resulted in 4-8% phytotoxicity. Fluometuron, at 8.96 kg/ha followed by 4.48 kg/ha, resulted in 25% phytotoxicity. Other combinations caused no phytotoxicity symptoms in taniers.

81-1222. Badel, R. E.; Ayala, A. (Crop Prot. Dep., Coll. Agric. Sci., Univ. Puerto Rico, Mayaguez, PR 00708) **Chemical control of coffee nematodes in seedbeds in Puerto Rico.** *J. Agric. Univ. P. R.* 64(4): 474-481; 1980 (20 references).

When pre-plant soil treatments or foliar sprays of fenamiphos, oxamyl and fensulfothion were applied to coffee fields, good nematode control was achieved. When granular fenamiphos was incorporated in soil at 11.2 kg/ha, 15 days prior to planting, followed by foliar applications of 1.12 or 2.24 kg AI/ha, coffee seedlings were adversely affected. Within 4 mo of transplanting phytotoxicity symptoms developed. Mean root lengths were 9.50 cm in controls (with 80 nematodes/1 g root), 8.50 cm in seedlings with the highest dose regimen (6 nematodes/g root), and 13.30 cm in seedlings treated at the lower dose regimen (5 nematodes/g root). These results are similar to those observed on other crops treated with fenamiphos.

81-1223. Ogg, R. N.; Menczel, J. H. (US EPA, Region II, New York, NY) **Disposal of hazardous wastes: problems and pitfalls.** *J. Air Pollut. Control Assoc.* 31(2): 127-132; 1981 (4 references).

Two cases are described which exemplify the regulatory approach used by the EPA Region II to address toxic emissions problems associated with waste disposal. At a municipal solid waste disposal and recycling plant located on Long Island, NY, toxic substances emissions from 2 boilers which burned refuse derived fuel were detected. A review of the emissions showed that several toxic compounds were present at low levels, but were not considered to pose an unacceptable hazard to the community. During a restudy of the findings, TCDD was discovered, and an immediate plan was put into action to determine the source and amount of TCDD, and whether or not the public health was threatened. A liquid and solid waste incinerator disposing of industrial wastes in southern New Jersey was found to be emitting toxic substances from a stationary furnace and rotary kiln incinerator. An agreement between the facility and the EPA was made to limit ash content of emissions and impose stringent temperature limitations during incineration of wastes suspected to be toxic or carcinogenic. The facility has also requested permission to dispose of PCB containing wastes; this is currently under consideration.

81-1224. Albert, R. E. (Inst. Environ. Med., Med. Cent., New York Univ., New York, NY 10016) **Risk assessment in federal regulatory agencies.** *J. Environ. Pathol. Toxicol.* 4(2-3): 581-585; 1980.

Some of the difficulties encountered by federal regulatory agencies in assessing risk of chemical carcinogens are discussed. Decisions concerning the central issues are critically necessary since very few of the (~) 500 agents, for which there is substantial evidence for carcinogenicity, have been adequately tested, and since most of the chemicals (~ 40,000) now in commercial use have not been tested for carcinogenicity at all. Chemical risk assessment should include determinations of the probability of human carcinogenicity and what population cancer rates are probable if the chemical is unregulated or regulated. Since levels of risk are much lower than can be directly demonstrated by human or animal studies, extrapolation of available data is necessary. If only animal

data are available a double extrapolation, from animals to humans and from high doses to low doses, must be performed. Use of the linear non-threshold dose-response model for data extrapolation can provide practical, upper limit of risk estimates. Difficult decisions regarding safe levels and certain economic or social advantages are also discussed.

81-1225. Orris, P. (Sect. Occup. Med., Cook Cty. Hosp., Chicago, IL 60612) **Unjustified conclusion?** *J. Occup. Med.* 23(1): 7-8; 1981 (2 references).

In a letter-to-the-editor, several assumptions made in a previous article that led to the conclusion that dioxin could not be considered a potent carcinogen are questioned. Criticism of the original study, on workers exposed to TCDD, are that exposure levels or duration of exposure were not specified, that observation of a carcinogenic effect may not have taken into account a long latent period and that it is not justified to assume the liver is the only target organ in TCDD toxicity. It is concluded that any significant increase in cancer incidence in the small population with low level, short-term exposure could indicate great carcinogenic potential of the compound.

81-1226. Cook, R. R. (Dow Chem. USA, Midland, MI 48640) **Unjustified conclusion? - Author's response.** *J. Occup. Med.* 23(1): 8; 1981 (4 references).

In response to a letter-to-the-editor, answers are given to some questions raised about the data evaluated in a study of worker mortality after exposure to TCDD. Exposure levels were not quantified in the original study due to sensitivity levels of the analytical techniques. Since the major route of exposure was assumed to be percutaneous absorption, wipe test samples were assayed on rabbit ears. Durations of exposure were not included since the study was aimed at determining mortality after high, subacute exposures. Statistical treatment of the data is also reviewed. It is also noted that the conclusion of the original study was that dioxin could not be considered a potent human carcinogen with organ or tissue specificity.

81-1227. Mel'nikov, N. N. (All-Union Res. Inst. Chem. Means Plant Prot., Leningrad, USSR) **Feromony nasekomykh v zashchite rastenii. [Insect pheromones in plant protection.]** *Khim. Sel'sk. Khoz.* 18(12): 7-8; 1980 (Russian).

Current studies of sex attractants and aggregated pheromones are reviewed. It is emphasized that the use of pheromones can reduce markedly the amount of insecticides required to provide the selective control of insect pests. To enhance the effectiveness of the research in this field cooperative pheromone studies are recommended. Research on identification of the chemical structure of pheromones is also encouraged.

81-1228. Promonenkov, V. K.; Lebedeva, K. V. (All-Union Res. Inst. Chem. Means Plant Prot., Leningrad, USSR) **Issledovaniya v oblasti fermonov nasekomykh. [Research in the field of insect pheromones.]** *Khim. Sel'sk. Khoz.* 18(12): 8-11; 1980 (11 references) (Russian).

Recent successes in the synthesis of sex pheromones are briefly discussed, and their applications for the surveillance and control of insect pest flight are described. Complete identification of all components of the pheromone was carried out only for few pest species. Conclusion on the correct identification can be made only after field trials of biological activity of the pheromone.

81-1229. Pristavko, V. P. (Dep. Zool. & Parasitol., Byelorussian Acad. Sci., Minsk, USSR) **Primenenie feromonov dlya ucheta chislennosti nasekomykh. [Use of pheromones for estimation of insect numbers.]** *Khim. Sel'sk. Khoz.* 18(12): 11-13; 1980 (8 references) (Russian).

Advantages and disadvantages of the use of pheromones for the estimation of insect numbers are briefly discussed. Discrepancies between the actual number of insects and the estimated numbers are emphasized. Pheromone lures provide a relatively reliable estimate is cases of low density populations; in high density populations the females releasing the juvenile hormone compete with synthetic pheromone. It is emphasized that certain standardization of lure methods is required for the estimation of the relative number of insects.

81-1230. Kolesova, D. A.; Chnyr', P. G. (All-Russian Res. Inst. Plant Prot., Leningrad, USSR) **Rezul'taty polevykh ispytanii polovogo attraktanta gorokhovoi plodozhorki. [Results of field trials of sex pheromone of pea moth.]** *Khim. Sel'sk. Khoz.* 18(12): 13-14; 1980 (6 references) (Russian).

The results of field trials of synthetic sex pheromones of pea moth (dodecadienylacetate) are reported. The average number of male pests in the lures containing 1.0, 2.0 and 5.0 mg of pheromone was 2.7, 6.6 and 7.9. Pheromone at 0.5 mg/lure was ineffective.

81-1231. Oleshchenko, I. N.; Ismailov, V. Ya.; Iatsynin, V. G. (North. Caucasian Res. Inst. Phytopathol., USSR) **Sinteticheskie polovye feromony nekotorykh vidov zhukov-shchelkunov. [Synthetic sex pheromones of certain click beetles.]** *Khim. Sel'sk. Khoz.* 18(12): 14-16; 1980 (11 references) (Russian).

The results of field trials of synthetic pheromones of several species of click beetles are reported. The biological activity of pheromones was tested by the means of special lures; pheromones were tested in doses ranging from 0.2-10 mg to 0.2-40 mg/lure. The optimal doses of pheromones were in a 1.2 mg/lure range; pheromone in optimal dose provided the capture of males within 30-40 days, and attracted 1.5-2 fold more males than the virgin female.

81-1232. Sherman, L. V. (Ukrainian Res. Inst. Plant Prot., USSR) **Primenenie feromonnykh lovushek dlya otlova sovok na liutserne. [Use of pheromone lures for catching the cutworm moth in lucerne crop.]** *Khim. Sel'sk. Khoz.* 18(12): 16-17; 1980 (Russian).

The pheromones of 5 species of cutworm moth were tested in lucerne crop. It was found that 20 species of cutworm moth were attracted by synthetic pheromones. *Discetra trifolii* was attracted by *cis*-7-dodecenol acetate; addition of its alcohol at 1:1 and 1:0.5 ratios reduced the attractant activity.

81-1233. Slavgordskaya-Kurpieva, L. E. (Crimean Agric. Inst., Simferopol, USSR) **Primenenie polovykh attraktantov iablonnoi plodozhorki v sadakh Kryma. [Use of sex pheromones of apple moth in Crimean orchards.]** *Khim. Sel'sk. Khoz.* 18(12): 18-19; 1980 (Russian).

The efficacy of sex pheromones against apple moth was tested in apple orchards (Crimea, USSR). Synthetic Soviet preparations SR-1, SR-2, SR-3, and SR-4, and United States Codlemon preparation, were used. The efficacy of disorientation of males was compared with chemical control. Repeated application of pheromones at 2 mg/tree provided effective pest control, reducing fruit damage to 1.89%, compared with 12.73% in nontreated trees.

81-1234. Bykhovets, A. I.; Sumaroka, A. F.; Zolotar', R. M. (Byelorussian Inst. Plant Prot., USSR) **Primenenie polovykh feromonov dlya izucheniya dinamiki leta iablonnoi plodozhorki i opredeleniya srokov provedeniya khimicheskoi bor'by s nei v usloviiakh Belorussii. [Use of sex pheromones for the study of the dynamics of flying of apple worm and determination of the timing of chemical control in Byelorussia.]** *Khim. Sel'sk. Khoz.* 18(12): 19-21; 1980 (3 references) (Russian).

To enhance the efficacy of control of apple worm, pheromone lures were used for estimation of the periods of maximum flying of the pest. The synthetic pheromones tested were found to have a broad spectrum of activity. It was recommended that chemical control measures should be carried out after catching 5 males in 1 lure within 1 wk.

81-1235. Kokhmaniuk, F. S. (State Educ. Inst., Brest, USSR) **Attaktanty neparnogo shelkopriada (analiticheskii obzor). [Attractants of gypsy moth (literature review).]** *Khim. Sel'sk. Khoz.* 18(12): 21-24; 1980 (70 references) (Russian).

Literature data on the use of attractants for control of the gypsy moth are reviewed. Benzene extracts of natural attractants were found to retain activity for several years. Attractant activity was found to depend on the age of the female, the time of the onset of extraction, the phase of development of the pest, and the biological characteristics of the imago. Synthetic analogs of natural attractants of the gypsy moth (disparlure) showed high activity in a number of laboratory and field trials. The disparlure lures were effective only in populations with low gypsy moth density. Spraying of forests with disparlure at 0.2-1 g/ha provided a 99% disorientation of males.

81-1236. Zubov, P. A. (All-Union Res. Inst. For. Mech., Pushkino, USSR) **Ispol'zovanie dispaliura v lesnom khoziaistve. [The use of disparlure in forestry.]** *Khim. Sel'sk. Khoz.* 18(12): 24-25; 1980 (2 references) (Russian).

The results of field trials on the biological activity of the synthetic pheromone disparlure are reported. Effective concentrations of disparlure ranged from 0.05 to 500 μg/lure, depending upon the pest species. Disparlure retained its activity for 30-60 days. Disparlure was found to reduce gypsy moth numbers only in low density populations.

81-1237. Uchakina, V. A. (Res. Inst. Biol., State Univ., Rosrov, USSR) **Opyt ispol'zovaniya dispaliura v Rostovskoi oblast. [Use of disparlure in Rostov region.]** *Khim. Sel'sk. Khoz.* 18(12): 25-26; 1980 (Russian).

The results of the experiments on the use of the pheromone disparlure for the estimation of gypsy moth numbers in Rostov (USSR) are reported. The disparlure lures were found to significantly reduce the number of male pests.

81-1238. Valenta, V. T.; Gavyalis, V. M.; Iakaitis, B. Yu (Lithuanian Res. Inst. For., USSR) **Preparaty dlia privlecheniya koroeda-tipografa. [Substances for attracting bark beetles.]** *Khim. Sel'sk. Khoz.* 18(12): 26-27; 1980 (3 references) (Russian).

The results of laboratory and field trials of various attractants of bark beetles are reported. *Cis*- and *trans*-verbenols, ipsdienol, and dimethylvinylcarbinol were tested. These compounds and their mixtures were placed in olfactory lures. The highest catch was recorded in lures containing ipsdienol, *cis*-verbenol, and dimethylvinylcarbinol at a 1:1:10 ratio.

81-1239. Sadovnikova, T. P.; Borisenko, T. G. (All-Union Res. Inst. For. Mech., Pushkino, USSR) **Rezul'taty ispytanii attraktantov koroeda-tipografa v Permskoi oblasti. [Trials of pheromones of bark beetle in Perm region.]** *Khim. Sel'sk. Khoz.* 18(12): 28-29; 1980 (3 references) (Russian).

The results of field trials of 2 formulations of syn-

thetic bark beetle pheromone (ipslur and pheraprax) are reported. Ipslur (dimethylvinylcarbinol: *cis*-verbenol: ipsdienol at 150:7:1) was tested in sealed plastic bags containing the mixture and as bilayer tape. Pheroprax (the same mixture, without ipsdienol) was tested only in plastic bags. Pheromone lures were found to attract beetles: average daily catch ranged from 0.7 to 57 beetles depending upon the type of the lure. Bands with ipslur provided even evaporation of the pheromone and thus provided a more effective control of bark beetles.

81-1240. Terekhova, A. I.; Verzunova, L. I. (Author address not given) **Preparativnye formy feromonov. [Pheromone formulations.]** *Khim. Sel'sk. Khoz.* 18(12): 29-30; 1980 (4 references) (Russian).

In an effort to prolong the duration of action of sex pheromones, various polymer formulations were subjected to gas-chromatographic analysis. It was found that within 3-4 mo the ratio of components in the polymer-pheromone mixture against Eastern moth (Z-8-dodecenyl-acetate and dodecyl alcohol) changed from 1:10 to 1:2, although the biological activity of the formulation could be recorded for more than 3 mo. The residual amounts of pheromone ranged from 0.01%-1%.

81-1241. Brovko, V. V.; Mazur, V. G.; Vlasov, A. A.; Shishmakova, T. G.; Strepkova, L. S.; Evstifeev, A. V. (Siberian Res. Inst. Chem. Agric., USSR) **Sintez polovykh feromonov yablonnoi i slivovoi plodozhorok i komnatnoi mukhi. [Synthesis of sex pheromones of apple and cherry worms and housefly.]** *Khim. Sel'sk. Khoz.* 18(12): 30-32; 1980 (13 references) (Russian).

Synthesis of sex pheromones of apple worm, cherry worm and housefly is described. The synthesized compounds (*trans,trans*-8, 10-dodecadienol, *cis*-8-dodecenylacetate, and *cis*-9-tricosen, respectively) were found to attract males, and thus provide effective pest control without environmental pollution.

81-1242. Yatsynin, V. G.; Oleshchenko, I. N.; Rubanova, E. V.; Ismailov, V. Ya. (North. Caucasian Res. Inst. Phytophatol., USSR) **Identifikatsiya aktivnykh komponentov polovykh feromonov shcheklunov kubanskogo, stepnogo i polosatogo. [Identification of sex pheromones of click beetles *(Agriotes).*]** *Khim. Sel'sk. Khoz.* 18(12): 33-35; 1980 (6 references) (Russian).

The results of identification of sex pheromones of click beetles (*Agriotes gurgistanus* Fald., *A. litigiosus* Rossi, and *A. lineatus* L.) are reported. Juvenile hormone isolated from 200-300 mature females was subjected to combined gas chromatography-mass spectrometry. The isolated pheromones were identified as geranylisovalerate, granylbutyrate and farnesylactate + nerylisovalerate, respectively. Field trials of synthesized model pheromones showed that they attracted corresponding male pests.

81-1243. Mesheryiakova, I. V.; Vaziulya, A. G. (Author address not given) **Osobennosti zashchity sadov, povrezhdennykh morozami. [Characteristic features of protection of frost-damaged orchards.]** *Konservn. Ovoshchesush. Prom.* (11): 34-36; 1980 (Russian).

Protective measures in frost-damaged orchards are described. It is emphasized that during the rainy weather frost burns can be aggravated by burns caused by copper containing fungicides such as Bordeaux mixture and Cuprosan (copper oxychloride). This results in impairment of the physiological processes in the plant. It is suggested that the frost-damaged orchards should be treated with systemic fungicides.

81-1244. Honchar, P. A.; Halperin, W. E. (Industry-wide Stud. Branch, Div. Surveil. Hazard Eval. & Field Stud., NIOSH, Cincinnati, OH 45226) **2,4,5-T, trichlorophenol, and soft tissue sarcoma.** *Lancet* 1(8214): 268-269; 1981 (7 references).

In this letter to the editor the possible relationship between soft tissue sarcoma and occupational exposure to phenoxy herbicides and chlorophenols is considered. Four cohorts of exposed workers were examined. Of the 105 deaths reported among these 4 cohorts, 3 (2.9%) were due to soft tissue sarcoma. Only 0.07% of deaths among US males aged 20-84 yr in 1975 were attributable to soft tissue sarcoma. The workers had been exposed either to 2,4,5-T or 2,4,5-trichlorophenol, both of which are contaminated with TCDD. None of the 4 cohorts individually demonstrated an excess risk for soft tissue sarcoma. However, when reported jointly, a common pattern is indicated. It is suggested that data from small cohorts of workers in similar industries be combined to allow greater statistical import of the findings.

81-1245. Anonymous **Individual susceptibility.** *Lancet* 1(8216): 368; 1981 (3 references).

In this editorial the role of individual susceptibility in the toxicity of pesticides, drugs, and other chemicals is discussed. A case is described of a 6-yr-old girl who was sprayed with a 15% solution of the blackfly repellent *N,N*-diethyltoluamide (DET; deet). A toxic encephalopathy developed. After dosing with chloral hydrate, convulsions occurred; the patient died on day 8 of the illness. The patient had a history of milk intolerance, protein aversion, and episodes of hyperammonemia. The final illness produced evidence of ornithine carbamoyltransferase (OCT) deficiency. A low hepatic OCT may increase susceptibility to hepatotoxic drugs, and it is suggested that the OCT deficiency sensitized the patient to the

toxic action of DET. It is recommended that DET containers should carry a warning against use by people with metabolic defects.

81-1246. Sun, C. N.; Georghiou, G. P.; Weiss, K. (Div. Toxicol. & Physiol., Dep. Entomol., Univ. California, Riverside, CA 92521) **Toxicity of *Bacillus thuringiensis* var. *israelensis* to mosquito larvae variously resistant to conventional insecticides.** *Mosq. News* 40(4): 614-618; 1980 (11 references).

The possibility of cross-resistance to *Bacillus thuringiensis israelensis* in strains of *Culex quinquefasciatus* Say and *Anopheles albimanus* Wied. that are resistant to conventional chemical insecticides (organophosphates, carbamates, DDT, dieldrin and pyrethroids) was examined. A time course study on 4th instar larvae indicated that toxic effects were produced within minutes after exposure, and that a steady state was reached within about 24 hr. After 15 min of treatment, a concentration of 14 IU/ml killed 50% of the larvae (14 μg/ml); 24 IU/ml produced a 95% mortality in the same time period. Significant differences in the response to *B. t. israelensis* toxin between insecticide-susceptible and insecticide-resistant strains of the species tested were not reported. Cross-resistance to DDT or dieldrin, that is present in certain of the strains tested, did not appear to extend to *B. t. israelensis*. *Anopheles* were found to be more tolerant to *B. t. israelensis* than *Culex*.

81-1247. Kreiss, K.; Zack, M. M. (Cent. Dis. Control, Atlanta, GA 30333) **Alcohol consumption and high-density-lipoprotein cholesterol.** *N. Engl. J. Med.* 304(9): 539; 1981 (1 reference).

A letter to the editor is presented which confirms a previously reported finding that alcohol and weight are significant independent predictors of high-density-lipoprotein (HDL) cholesterol. In the current study, the population (a total of 348 persons, 8-90 yr of age) was 87% black, rural, of low socioeconomic status, and showed an unusually high accumulation of a DDT metabolites due to ingestion of contaminated fish. Age, sex, race, alcohol consumption, and Quetelet's index ($wt \div height^2$) were each significantly related in multiple regression analysis to HDL cholesterol. Serum ΣDDT was found to correlate with γ-glutamyl transpeptidase (reflecting microsomal enzyme induction), and with total cholesterol, but not with HDL cholesterol.

81-1248. Merigan, W. H., ed.; Weiss, B., ed. (Dep. Radiat. Biol. & Biophys., Med. Cent., Univ. Rochester, Rochester, NY 14642) ***Neurotoxicity of the Visual System.*** *(Raven Press: New York, NY):* 274 pp.; 1980.

The visual system is the target of a wide range of environmental contaminants. When using a multidisciplinary approach, ophthalmology, occupational medicine, psychology, neurophysiology, anatomy, pathology, and neurochemistry, to understand the complications and implications of visual system toxicity, successful integration of communications from the various fields is required. This volume was written to facilitate that communication. Studies on fossil fuel technology substances, methylmercury, heavy metals, and organophosphorus pesticides are presented. Epidemiological studies on humans, as well as experiments on laboratory animals are included. Abstracts of papers from this volume will be found in the appropriate sections of this issue of *Pesticides Abstracts.*

81-1249. Anonymous **Cereal pesticides drift onto nearby plants.** *New Sci.* 89(1235): 73; 1981.

Significant damage to non-target crops has resulted from the vaporization and drift of pesticides after application. Drift of vapors up to 20 m has occurred. Three herbicides (bromoxynil, ioxynil and mecoprop iso-octyl ester) were tested for their ability to vaporize and drift. Cabbage and cauliflower plants showed signs of herbicide damage 8 and 30 hr after herbicide application to adjacent grassy areas. Crops placed in the area 54 hr after application were not damaged.

81-1250. Pallett, K. E.; Caseley, J. C. (Agric. Res. Counc., Weed Res. Org., Yarnton, Oxford OX5 1PF, England) **Differential inhibition of DNA synthesis in difenzoquat tolerant and susceptible United Kingdom spring wheat cultivars.** *Pestic. Biochem. Physiol.* 14(2): 144-152; 1980 (18 references).

Tolerant and susceptible spring wheat cultivars were used in investigations on the factors affecting the sensitivity to the herbicide difenzoquat. Wheat plants grown in a controlled environment room were sprayed with 1.6 kg AI/ha difenzoquat while at the 2-leaf stage. Penetration of the herbicide was determined following application of [^{14}C]pyrazolium ring-labeled difenzoquat, and translocation was studied following application of ten 0.5 μl drops of a 4 μg AI/μl solution along the length of the lamina of leaves 1 and 2. Studies were also carried out on the effects of difenzoquat on cell elongation and cell division. Data indicated that the differential sensitivity could not be due to differences in retention of spray solution, development of chlorosis, foliar penetration and movement of ^{14}C-difenzoquat, or cell elongation. However, it was noted that susceptible plants showed a greater reduction in main shoot length, lamina length, and foliage dry matter. DNA synthesis in the apical meristem was inhibited substantially more in susceptible plants, and it is suggested that this differential inhibition may be a major contribution to the differences in response of the 2 strains.

81-1251. Sandmann, G.; Bramley, P. M.; Boger, P. (Lehrstuhl Physiol. & Biochem. Pflanzen, Univ. Konstanz, D-7750 Konstanz, BRD) **The inhibitory mode of action of the pyridazinone herbicide norflurazon on a cell-free carotenogenic enzyme system.** *Pestic. Biochem. Physiol.* 14(2): 185-191; 1980 (23 references).

Studies using a carotenogenic cell-free fungal enzyme system were designed to elucidate the inhibitory sites of the pyridazinone herbicides in the biosynthetic pathway of carotenes from mevalonic acid to β-carotene. The enzyme system used was from a mutant strain of *Phycomyces blakesleeanus*, and the herbicide norflurazon was added to the reaction mixture. Norflurazon caused reductions in the flow of radioactivity from [2-^{14}C]mevalonic acid to phytoene and β-carotene, and an increased incorporation of radioactivity in the C_{30} terpenoids, squalene, and ergosterol. No radioactivity was found in prephytoene pyrophosphate. The data indicate that norflurazon exerts its primary inhibitory action on the reaction catalyzed by phytoene synthetase.

81-1252. Sharma, S. R.; Sohi, H. S. (Indian Inst. Hortic. Res., Bangalore, India) **Uptake, translocation and persistence of systemic fungicides in cowpea.** *Pesticides* 14(5): 21-24; 1980 (15 references).

The uptake, translocation, and persistence of 5 systemic fungicides were studied in seeds of the cowpea *(Vigna sinensis)*. Treated seeds were allowed to germinate for 4, 7, 16, 20 or 36 hr, then extracts of individual parts of germinating seeds were subjected to bioassay using *Rhizotonia solani*. Bavistin (carbendazim), Calixin (tridemorph), NF-44 (thiophanate methyl) and NF-48 (thiophamine) were taken up by the germinating seeds within 4 hr. Benlate (benomyl) was taken up later. With Benlate and Bavistin, maximum antifungal activity was observed in cotyledons. Hypocotyls showed maximum activity for NF-44 and Calixin. NF-48 produced maximum activity in radicals. When treated seeds were grown in pots, antifungal activity could be detected up to 21 days after germination. In other tests, plants in the first trifoliate leaf stage were sprayed with the fungicides. Translocation and persistence were observed for up to 25 days.

81-1253. Gordon, A. J.; Flood, A. E. (Dep. Plant & Crop Physiol., Grassland Res. Inst., Hurley, Nr Maidenhead, Berkshire SL6 5LR, England) **2,4-Dichlorophenoxyacetic acid and the *de novo* synthesis of invertase in chicory root tissue.** *Phytochemistry* 19(4): 505-508; 1980 (22 references).

Increased invertase activity due to 2,4-D treatment of chicory root tissue was suggested to be due to *de novo* synthesis of enzyme protein. A dual labeling technique was used in conjunction with invertase purification techniques. Increased invertase protein synthesis in the presence of 2,4-D was not detected. The modification of a preformed inactive invertase precursor by 2,4-D is suggested as another possible explanation for the increased invertase activity.

81-1254. Robinson, J. S., ed. ***Hazardous Chemical Spill Cleanup.*** **1979.** *Pollut. Technol. Rev.* 59: 406 pp.; 1979 (19 references).

The purpose of this book is to serve as a practical guide and manual for controlling hazardous spills. Emphasis is on spill control and cleanup methods. Legislative aspects currently in force are reviewed. Cost figures if available, are provided for the methods. Mechanical methods for cleanup, include dispersion and dilution, containment, floating of hazardous chemicals, dredging, burial, barriers, dikes and trenches. Chemical cleanup methods include neutralization, precipitation, chelation, redox methods, and biodegradation. Sorbents, gels and foams, and mobile emergency units are also reported. Abstracts of papers from this book will be included in the appropriate sections of this issue of *Pesticides Abstracts*.

81-1255. Hart, C. W., Jr., ed.; Fuller, S. L. H., ed. (Natl. Mus. Nat. Hist., Smithsonian Inst., Washington, DC) ***Pollution Ecology of Estuarine Invertebrates.*** (Academic Press: NY): 406 pp.; 1979.

In this book the effects of water pollution on various estuarine invertebrates are considered. Not all major invertebrate groups are represented. Groups included in this volume are thread worms (Nematoda), bryozoa (Ectoprocta), bristle worms (Annelida: Polychaeta), ostracods (Arthropoda: Crustacea: Ostracoda), copepods (Arthropoda: Crustacea: Copepoda), crabs (Arthropoda: Crustacena: Decapoda: Brachyura), shrimps (Arthorpoda: Decapoda), *Cyathura* (Arthropoda: Crustacea: Isopoda: Anthuridae), isopods other than *Cyathura* (Arthropoda: Crustacea: Isopoda), amphipods (Arthropoda: Crustacea: Amphipoda), and clams and snails (Mollusca: Pelecypoda and Gastropoda). Abstracts of chapters from this book will appear in the appropriate sections of this issue of *Pesticides Abstracts*.

81-1256. Ferris, V. R.; Ferris, J. M. (Dep. Entomol., Purdue Univ., West Lafayette, IN 47906) **Thread worms (Nematoda).** In: *Pollution Ecology of Estuarine Invertebrates.* Hart, C. W., Jr. and S. L. H. Fuller, eds. (Academic Press: NY): CH01: 1-33; 1979 (129 references).

The pollution ecology of estuarine and freshwater nematodes is reviewed. The importance and function of nematodes in aquatic ecosystems is considered, including density, trophic position, reproduction and life cycles and bioenergetics of the species. For freshwater nematodes information is provided concerning the ecology of normal and polluted habitats. For coastal marine nematodes and estuarine nematodes information is given on factors that

influence nematode ecology of unpolluted habitats, community structure, and the ecology of polluted habitats. An increasing problem in polluted estuaries is the transport and accumulation of pesticides from runoff. The importance of the role of nematodes in normal aquatic ecosystems is well established. The use of nematodes as indicators of pollution levels is somewhat more complicated. In shallow, silty habitats a few species reach high percentage abundances. In sandy substrates more species have lower maxima, probably indicating greater diversity of niches in the sandy substrates. The enrichment of an area by diverse substances classified as mild pollutants results in an increase in a few species. This is also true in cases of heavier pollution.

81-1257. Soule, D. F.; Soule, J. D. (Harbors Environ. Proj., Inst. Mar. & Coastal Stud., Allan Hancock Found., Univ. South. California, Los Angeles, CA) **Bryozoa (Ectoprocta).** In: *Pollution Ecology of Estuarine Invertebrates.* Hart, C. W., Jr. and S. L. H. Fuller, eds. (Academic Press: NY): CH02: 35-76; 1979 (120 references).

Various species of adult bryozoa are often prominent members of the communities on substrata in estuaries, ports and harbors. Habitats, estuarine zoogeography, the influence of natural and man-made disturbances, and analytical approaches are discussed. Studies of environmental pollution effects on bryozoa are reviewed. The resistance of bryozoans to antifouling measures, such as copper-containing paints, is considered. Effluents containing corroded copper particles from antifouling maintenance procedures at a large-scale desalination plant in Key West, Florida, were found to have harmful effects on the flora and fauna of the region. Copper concentrations of 0.2-0.3 ppm have been found to inhibit growth of the bryozoan *Bugula neritina*; > 0.3 ppm copper was toxic to larval stages. The effects of temperature changes on bryozoan populations are also reported.

81-1258. Williams, A. B.; Duke, T. W. (Natl. Mar. Fish. Serv. System. Lab., Natl. Mus. Nat. Hist., Smithsonian Inst., Washington, DC) **Crabs (Arthropoda: Crustacea: Decapoda: Brachyura).** In: *Pollution Ecology of Estuarine Invertebrates.* Hart, C. W., Jr. and S. L. H. Fuller, eds. (Acacemic Press: NY): CH06: 171-233; 1979 (264 references).

The taxonomy, normal life history, and pollution ecology of crabs are reviewed. The effects of organochlorine, organophosphorus and carbamate pesticides, juvenile hormones, and insect growth regulators on crabs are considered. Chlorinated hydrocarbons, including DDT and its metabolites, dieldrin, mirex and Kepone (chlordecone) are lipid soluble, and have been detected in marine organisms, including brachyuran crabs. *Cancer magister* from the Georgia Straits near British Columbia were found to contain not detectable (ND)-22.0 ppb heptachlor epoxide and 23.0-295.8 ppb *p,p'*-DDE. DDT and dieldrin residues were reported in blue crabs *(Callinectes sapidus)* from San Antonio Bay, Texas; of 81 crabs analyzed, 94% contained DDT, 32% dieldrin, and 28% both chemicals. DDE levels were ND-68.20 ppb. Dieldrin ranged form from ND-68.2 ppb. DDT and its metabolites were found in blue crabs from the York River in Virginia. Highest concentrations were in the heptopancreas (55-217 ppb). The biomagnification of dieldrin residues is examined. The uptake of dieldrin by *Cataleptodius* larvae was investigated. The larvae accumulated dieldrin 19.1-fold as fast from 0.5 ppb in seawater as from 213 ppb in food. Laboratory data have shown that chlorinated hydrocarbons are extremely toxic to estuarine crabs. Development, molting and limb regeneration have been shown to be effected. A case history of the impact of mirex on crabs is presented. Organophosphates and carbamates have also been found to be toxic to crabs. The effects of malathion, carbofuran, Sevin (carbaryl), Dursban (chloropyrifos) and Abate (temephos) are discussed. Survival, molting and behavior of crabs have been found to be affected. Bioaccumulation has also been detected. Juvenile hormone mimics and insect growth regulators are also expected to be harmful to crabs due to the close relationship between insects and crustaceans. Studies with MON-0585, methoprene, and Dimilan (diflubenzuron) are considered.

81-1259. Powell, C. E., Jr. (Acad. Nat. Sci., Philadelphia, PA 19105) **Isopods other than *Cyathura* (Arthropoda: Crustacea: Isopoda).** In: *Pollution Ecology of Estuarine Invertebrates.* Hart, C. W., Jr. and S. L. H. Fuller, eds. (Academic Press: NY): CH10: 325-343; 1979 (103 references).

The biology of isopods is briefly reviewed, and the increased effects of specific pollutants during molting are discussed. Pollutants considered include organic pollution, pesticides, detergents, ammonium nitrate, radiation, manganese and cesium. Salinity and temperature are also considered, and the synergistic effects of salinity, temperature and heavy metals are discussed. Many studies concerning the toxic effects of pesticides on crustaceans have been conducted. However the effects of pesticides on estuarine isopods has not been studied. Due to the close relation between Crustacea and insects it is assumed that harmful effects on the isopod fauna will occur as a direct result of pesticide applications. Organochlorines are readily adsorbed on particulate matter, which is taken up by isopods during the ingestion of food material. It is predicated that studies conducted on isopods will reveal that these organisms are affected behaviorally in terms of predator response, and neurologically in terms of ionic maintenance.

81-1260. Kudo, A.; Miyahara, S.; Miller, D. R. (Div. Biol. Sci., Natl. Res. Counc. Canada, Ottawa, Ontario

K1A OR6, Canada) **Movement of mercury from Minamata Bay into Yatsushiro Sea.** *Prog. Water Technol.* 13(1): 509-524; 1981 (29 references).

A quantitative description of the movement of mercury associated with bed sediments in Minamata Bay over time is presented. The tidal effect in the area of Minamata Bay is considerable. No bed sediment transport was attributable to tidal action. Bottom sediment samples were collected at 24 locations in the Yatsushiro Sea. Two additional locations were set outside the area. Mercury concentration in bed sediments was measured during 1975, 1976, 1977 and 1978. Results indicate that mercury contamination of Yatsushiro Sea is not serious. The majority of bed sediments contained < 1.0 ppm mercury. However, mercury movements into the sea have greatly increased in the past 3 yr. It is suggested that the artificial force brought about by dredging ships might be responsible for the movement of mercury from the bay to the sea. The increase of methyl mercury in the sea was measured at 5.8%/yr, compared to 42%/yr for total mercury.

81-1261. Anonymous **Dow attacks study used to ban 2,4,5-T.** *Sci. News* 115(11): 166; 1979.

Criticisms of the EPA Alsea, Oregon, study used to suspend use of the herbicides 2,4,5-T and silvex are presented. The criticism is directed toward the statistical analyses conducted on the spontaneous abortion rate data collected from the Alsea region which linked rises in abortion rates with past spraying of 2,4,5-T. The EPA also used data on birth defects, miscarriages, and carcinogenicity in laboratory animals exposed to the 2,4,5-T contaminant, TCDD, to suspend use of the chemicals. It is also noted that the Alsea women may have been exposed to ppt levels of TCDD in drinking water or wild game and, since it was not known whether these minute levels would harm human fetuses, 2,4,5-T was removed from the market.

81-1262. Gardner, G. (Biol. Sci. Res. Cent., Shell Dev. Co., Modesto, CA 95352) **Azidoatrazine: photoaffinity label for the site of triazine herbicide action in chloroplasts.** *Science* 211(4485): 937-940; 1981 (11 references).

Binding of the 4-azido analog of the herbicide atrazine to pea chloroplast membranes was compared with that of atrazine. When [^{14}C]azidoatrazine was treated with 300-nm uv light *in situ*, reversibility of binding was lost in proportion to the duration of irradiation. Sodium dodecyl sulfate-polyacrylamide gel electrophoresis of chloroplast membranes irradiated in the presence of [^{14}C]azidoatrazine indicated radioactivity in only one region, corresponding to a protein with a molecular wt of approximately 32,000. Azidoatrazine is a photoaffinity reagent for the triazine binding site in chloroplasts and serves as a label to identify this site, which may be the apoprotein of the secondary electron acceptor in photosystem II. (Author abstract by permission. Copyright 1981 by the American Association for the Advancement of Science)

81-1263. Haines, S. G.; Davey, C. B. (For. Soil Res., Bainbridge, GA) **Biomass response of loblolly pine to selected cultural treatments.** *Soil Sci. Soc. Am. J.* 43(5): 1034-1038; 1979 (11 references).

The effects of site preparation and other cultural treatments on the biomass of 1- and 2-yr-old loblolly pine (*Pinus taeda* L.) seedlings were examined. Treatments included various combinations of disking, applying herbicides fertilizing, subsoiling, fumigating the soil, irrigation and mowing. Herbicides used were simazine (6 kg/ha), paraquat (0.8 kg/ha), 2,4-D (3 kg/ha) and 2,4,5-T (8 kg/ha). Fumigation was with potassium azide. Oven-dry weights of stems, needles, roots, and branches were determined. Root collar diameter was significantly affected by treatment after both 1 and 2 growing seasons, and was as effective an indicator of treatment response as other variables singly or in combination. Herbicidal weed control was found to be effective for improvement of loblolly pine seedling growth in the first 2 yr after outplanting. (Author abstract by permission, modified)

81-1264. Diaz-Colon, J. D.; Bovey, R. W. (Agric. Res., SEA, USDA, College Station, TX) **Selected bibliography of the phenoxy herbicides. IX. Toxicological and physiological effects of 2,4-D.** *Tx. Agric. Exp. Stn. Misc. Publ.* 1454: 92 pp.; 1980 (810 references).

References dealing with the toxicological and physiological effects of 2,4-D on animals, humans, plants and microorganisms are listed in alphabetical order by author. The bibliography is separated with regard to the effects in animals and humans and in plants and microorganisms. A numerical subject index and a list of the abbreviated and complete names of sources are provided. Articles are listed which consider acute, subacute, and chronic toxicity to the major animal groups and humans, as well as reproduction, cytogenetic, and carcinogenic effects, and fate in humans and animals. References on public effects of 2,4-D are also given. Cytogenetic studies in microorganisms and plants and studies on reproduction and tumor induction in plants are also covered.

81-1265. Lilienthal, H.; Winneke, C.; Ewers, U. (Author address not given) **Tierexperimentalle Verhaltensuntersuchungen zur Erfassung neurotoxischer Wirkungen von Arbeits- und Umweltstoffen. [Behavioral studies on laboratory animals designed to identify the neurotoxic impact of environmental poisons.]** *Umwelthygiene (Duesseldorf)* 12: 34-59; 1979 (54 references) (German).

Methodological procedures suitable for assessing the neurotoxic effect of environmental poisons (including pesticides) from animal behavior are discussed. A wide spectrum of highly differentiated methodologies is available for such behavioral studies to distinguish between impacts on spontaneous activity, and motor sensory, interactive and adaptive behavior of laboratory animals. A previously proposed 2-step scheme using simple motor and

sensory tests as the first step, and more complicated neuromuscular tests and classical conditioning in the second step, is discussed. It is concluded to represent a workable behavioral toxicological test method. Inclusion of simple conditioning techniques such as avoidance training in the first step is suggested. The problem in evaluation of toxicological effects on behavior lies in the difficulty of separating primary from secondary behavioral disturbances. Additional target-oriented tests are required to distinguish between a neurotoxic effect on the CNS and regulatory malfunction due to the toxic impact of a substance on a specific body organ.

81-1266. Johnson, B. J. (Univ. Georgia, Georgia Stn., Experiment, GA 30212) **Residual effects of herbicides on newly planted bermudagrass *(Cynodon dactylon)*.** *Weed Sci.* 28(6): 716-719; 1980 (10 references).

Methazole [2-(3,4-dichlorophenyl)-1,2,4-oxadiazolidine- 3,5-dione], metribuzin [4-amino-6-*tert*- butyl-3-(methylthio) -*as*-triazin-5(4H) -one], and combinations of MSMA (monosodium methanearsonate) with either methazole or metribuzin, were applied to bare ground at 0, 1, 2 and 4 wk before planting with bermudagrass [*Cynodon dactylon* (L.) Pers. Common] as sprigs, stolons, and seed. In most instances, the growth of newly planted bermudagrass was as good or better from combination of MSMA (2.2 kg/ha) with either methazole or metribuzin at 0.1 kg/ha than with methazole or metribuzin applied alone at higher rates. MSMA + methazole can be applied safely on day of planting with sprigs and seed, but a 1-wk interval between treatment and planting was needed with stolons in 1 of 2 yr. The MSMA + metribuzin combination can also be applied safely to sprigged bermudagrass on day of planting, but a 1-wk interval was needed between treatment and planting with stolons and a 2-wk interval between treatment and planting with seed to insure minimum bermudagrass injury. (Author abstract by permission)

81-1267. Jordan, L. S.; Clerx, W. A. (Dep. Bot. & Plant Sci., Univ. California, Riverside, CA 92521) **Accumulation and metabolism of bromacil in Pineapple sweet orange *(Citrus sinensis)* and Cleopatra mandarin *(Citrus reticulata)*.** *Weed Sci.* 29(1): 1-5; 1981 (9 references).

Young orange [*Citrus sinensis* (L.) Osbeck, Pineapple sweet orange] trees are more sensitive to bromacil (5-bromo-3-*sec*-butyl-6-methyl uracil) than young mandarin (*Citrus reticulata* Blanco, Cleopatra manadarin) trees. Pineapple sweet orange roots absorbed twice as much ^{14}C from bromacil, and accumulated 3 times as much in the leaves, as did Cleopatra mandarin. The amount of conjugated metabolite formed was the same in the roots of the 2 cultivars, but twice as much formed in the leaves of Cleopatra mandarin as in the leaves of Pineapple sweet orange. The principle metabolite was tentatively identified as 5-bromo-3-(3-hydroxyl-1-methylpropyl)-6-methyluracil. No 5-bromouracil was detected. Citrus cultivars differ in their ability to accumulate and metabolize bromacil into conjugated nonphytotoxic compounds. (Author abstract by permission)

81-1268. Miller, S. D.; Nalewaja, J. D.; Pacholak, E. (Dep. Agron., North Dakota State Univ., Fargo, ND 58105) **MSMA for weed control in wheat *(Triticum aestivum)*.** *Weed Sci.* 29(1): 33-37; 1981 (12 references).

Postemergence applications of MSMA (monosodium methanearsonate) for weed control in spring wheat (*Triticum aestivum* L) were evaluated for phytotoxicity in the field, greenhouse, and controlled environmental chamber. MSMA controlled weeds better when applied to wheat at the 4-5 leaf stage than when applied at the 2-3 leaf stage. MSMA, tank mixed with barban (4-chloro-2-butynyl- *m*-chlorocarbanilate) or diclofop [2-[4-2,4-dichlorophenoxy) phenoxy]propanoic acid), controlled wild oat (*Avena fatua* L), green foxtail [*Setaria viridis* (L) Beauv] and broadleaf weeds better than did MSMA applied alone. Wild oat control with tank-mix applications of MSMA and difenzoquat (1,2-dimethyl-3, 5-diphenyl-*1H*- pyrazolium) was variable. Weed control with MSMA was enhanced by 30°C air temperatures, 90% relative humidity, and adequate soil moisture. A simulated rainfall of 0.5 mm within 0.5 hr or 4 mm within 4 hr after application reduced wild oat control with MSMA. (Author abstract by permission)

81-1269. Jachetta, J. J.; Radosevich, S. R. (Bot. Dep., Univ. California, Davis, CA 95616) **Enhanced degradation of atrazine by corn *(Zea mays)*.** *Weed Sci.* 29(1): 37-44; 1981 (37 references).

Photosynthesis in corn (*Zea mays* L., Pioneer 3369A) was inhibited 25% by atrazine [2-chloro-4-(ethylamino) -6-(isopropylamino) -*s*-triazine] after a 2 hr root exposure in nutrient solution. Photosynthesis of the treated plants had completely recovered 21.4 hr after removal from the treatment solution. Recovery of photosynthesis from second and third successive atrazine treatments required only 10.3 hr and 4.0 hr, respectively. Atrazine metabolism rates in corn plants after 1, 2, or 3 successive 4 hr treatment periods, where each treatment period was followed by a 12 hr recovery period, showed increased rates of metabolism of atrazine during each recovery time. An increased level of glutathione-*S*-atrazine was found following the first 4 hr atrazine treatment and 12 hr recovery. The enhanced productions of GS-atrazine was maintained throughout subsequent exposures and recoveries. An inverse correlation ($r^2 = 0.992$) was found between the increase in GS-atrazine production following each 4 hr atrazine exposure exposure and the time reqûired for corn plants to recover from atrazine-induced photosynthesis inhibition. Enhanced detoxification of atrazine by corn plants pretreated with atrazine was indicated. No

enhanced tolerance to other herbicides was observed from atrazine pretreatment. This phenomenon is similar to that described for the enhanced detoxification of several insecticides in animal systems. (Author abstract by permission)

81-1270. York, A. C.; Arntzen, C. J.; Slife, F. W. (Crop. Sci. Dep., North Carolina State Univ., Raleigh, NC 27650) **Photosynthetic electron transport inhibition by buthidazole.** *Weed Sci.* 29(1): 59-64; 1981 (41 references).

The effects of buthidazole 3-[5-(1,1-dimethylethyl) 1,3,4-thiadiazole- 2-yl]- 4-hydroxy-1-methyl- 2- imidazolidinone on the photochemical reactions of isolated pea (*Pisum sativum* L.) chloroplast thylakoids were analyzed. Buthidazole was found to inhibit electron transport at 2 distinct sites in the photosynthetic electron transport chain. The major site of inhibition was on the reducing side of photosystem II at the site of diuron [3-(3,4-dichlorophenyl) -1-1-dimethylurea] and atrazine [2-chloro-4-(ethylamino) -6-(isopropylamino)-*s*-triazine] inhibition. Buthidazole also had a secondary site of electron transport inhibition on the oxidizing side of photosystem II. No evidence was found for buthidazole to act as an uncoupler or as an energy transfer inhibitor. (Author abstract by permission)

81-1271. Ghadiri, H.; Wicks, G. A.; Fenster, C. R.; Burnside, O. C. (Dep. Agron., Univ. Nebraska, Lincoln, NE 68583) **Control of weeds in winter wheat *(Triticum aestivum)* and untilled stubble with herbicides.** *Weed Sci.* 29(1): 65-70; 1981 (13 references).

Visible wheat (*Triticum aestivum* L.) injury, delay in bloom date, and yield reduction were observed following herbicide treatments in growing wheat. Protein content and volume weight of winter wheat were not significantly affected by any herbicide treatment. Some treatments reduced annual grass and broadleaf population by 90% or more 6 wk after spraying and maintained weed control 8 wk in untilled winter wheat stubble. Effective herbicide treatments that caused the least winter wheat injury in 1977 and 1978 included metribuzin [4-amino-6-*tert*- butyl-3-(methylthio) -*as*-trazin-5(4H) -one] + alachlor [2-chloro-2′,6′- diethyl-*N*-(methoxymethyl) acetanilide] at 0.3 + 2.8 kg/ha, metribuzin + oryzalin (3,5-dinitro-*N*⁴, *N*⁴-diproylsulfanilamide) at 0.3 + 1,8 kg/ha, metribuzin + pendimethalin [*N*-(1-ethylpropyl) -3,4-dimethyl-2, 6-dinitrobenzenamine] at 0.3 + 2.2 kg/ha, metribuzin + SN-533 [*N*-ethyl-*N*-propylsulfonyl) -1*H*-1,2,4-triazole- 1-carboxamide] at 0.3 + 0.8 kg/ha, and R-40244 [1-*m*-trifluoromethylphenyl) -3-chloro-4-chloromethyl- 2-pyrrolidone] at 1.1 kg/ha. Herbicide treatments that showed that most potential to control annual grass and broadleaf weeds selectivity in tillered winter wheat and stubbe in 1978 include metribuzin + metolachlor [2-chloro-*N*-(2- ethyl-6-methylphenyl) -N-(2-methoxy-1-methylethyl) acetamide] at 0.3 + 2 kg/ha, metrizubin + oryazlin at 0.3 + 1.4 kg/ha, and metribuzin + pendimethalin at 0.3 + 2 kg/ha. (Author abstract by permission]

81-1272. Menges, R. M.; Tamez, S. (SEA USDA, Weslaco, TX 78596) **Response of onion *(Allium cepa)* to annual weeds and postemergence herbicides.** *Weed Sci.* 29(1): 74-79; 1981 (17 references).

Several herbicides were sprayed on emerged London rocket (*Sisymbrium irio* L.), common sunflower (*Helianthus annuus* L.), ragweed parthenium (*Parthenium hysterophorus* L.), annual sowthistle (*Sonchus oleraceus* L.), and onion (*Allium cepa* L. yellow granex PRR), to determine selectivity. Onion yields were reduced with common sunflower and London rocket interference within 7 wk after emergence. Oxadiazon [2-*tert*-butyl- 4-(2,4-dichloro- 5-isopropoxyphenyl) - ∂^2-1,3,4-oxadiazolin- 5-one] at 2.2 kg/ha controlled all but common sunflower under most field conditions and reduced the yield of onion in 1 experiment out of 6. Methazole [2-(3,4-dichlorophenyl)-4-methyl-1,2,4- oxadiazolidine- 3,5-dione] and bromoxynil (3,5-dibromo-4-hydroxybenzonitrile) reduced the yields of onion in 2 of 4 experiments and 3 of 6 experiments, respectively. Both herbicides controlled most weed species, but only bromoxynil controlled annual sunflower adequately. Onion was injured when low temperature, low light intensity, and high relative humidity occurred within 3 days of the application of herbicides. Bioassays showed that oxadiazon persisted 5 mo in soil in 3 of 5 experiments. Seeded London rocket populations reduced the growth of onion 20% within the first 4 wk and 65% within 12 wk after planting. (Author abstract by permission)

81-1273. Boerner, H. (Inst. Phytopathol., Univ. Kiel, D-2300 Kiel, BRD) **Uraschen der selektiven wirkung der photosynthesehemmer phenmedipham und bentazon. [Causes of the selective action of the photosynthetic inhibitors phenmedipham and bentazon.]** *Z. Naturforsch. Teil C* 34(11): 926-930; 1979 (12 references) (German).

Studies are reported which indicate that the differential sensitivity of broad-leaf weeds to the photosynthetic inhibitors phenmedipham and bentazon may be explained by the combined action of herbicide uptake and decomposition. One plant, *Beta vulgaris*, was not injured, despite a rapid uptake of phenmediphan, because the herbicide was metabolized very rapidly. Several other plants exhibited slower transformation of phenmedipham, but survived because of reduced uptake. Some plants were extremely sensitive because they showed neither protective mechanism. Similar results were obtained in tests with the herbicide bentazon.

81-1274. Hofvander, Y.; Hagman, U.; Linder, C. E.; Vaz, R.; Slorach, S. A. (Dep. Pediatr., Univ. Hosp., Uppsala, Sweden) **WHO collaborative breast feeding study. 1. Organochlorine contaminants in individual samples of Swedish human milk, 1978-1979.** *Acta Paediatr. Scand.* 70(1): 3-8; 1981 (17 references).

Results are reported of an analysis of organochlorine insecticides and PCBs in Swedish human milk carried out in 1978-1979. The analyses were part of a large WHO breast feeding study carried out in several countries. Milk samples were collected at 3 mo postpartum from 18 mothers, and at 6 mo postpartum from 24 mothers. Analysis was by gas chromatography using an electron capture detector. The organochlorine levels were similar in the 3 and 6 mo groups. In the 6 mo group, the mean levels (in μg/kg whole milk) were 51 for *p,p'*-DDE, (the major component of the DDT complex), 63 for PCBs, 4.4 for HCB (hexachlorobenzene), 0.2 for α-HCH (α-BHC), 3.3 for β-HCH (β-BHC), 0.1 for γ-HCH (lindane) and 0.7 for dieldrin. When the results are compared with studies carried out in 1967-1977, it is seen that DDT, β-HCH and dieldrin have decreased, PCBs have increased, and HCB has shown little change. Based on the calculated daily intake of the various contaminants via breast milk, it is concluded that the levels of these compounds in breast milk do not constitute a health risk.

81-1275. Khilik, L. A.; Baranov, Yu. S.; Iakubovich, A. D. (All-Union Res. Inst. Essent. Crops, Simferopol, USSR) **Sposoby khraneniya obraztsov pochvy, rastenii i efirnykh masel, soderzhashchikh ostatki gerbitsidov. [Methods of storage of samples of soil, plants, and essential oils containing herbicide residues.]** *Agrokhimiya* 12: 106-117; 1980 (4 references) (Russian).

The degradation rates of the herbicides Simbar (terbacil), Treflan (trifluralin), prometryne and simazine were studied to determine the optimal method of fixing and storing samples of soil, plant and essential oil containing herbicide residues. Samples with known herbicide content were fixed with ethanol or ethylacetate and stored at 2-4°C or at 18-20°C for different time periods. Herbicides residues were analyzed 2 wk and 1, 3 and 6 mo after initiation of the experiment by gas-liquid chromatography. Residues remained in the samples for 90-180 days.

81-1276. Ogilvie, D. (Dep. Zool., Univ. West. Ontario, London, Ontario, Canada) **Dioxin found in the Great Lakes Basin.** *Ambio* 10(1): 38-39; 1981.

Data on the contamination of the Great Lakes Basin with TCDD (2,3,7,8-tetrachlorodibenzodioxin) are presented, and the situation with regard to the transboundary (Canada-United States) pollution problem it creates is described. TCDD in the range of 43-90 ng/kg has been reported in herring gull eggs from Lake Huron, and at 44-64 ng/kg in eggs from Lake Ontario. Eggs collected in 1971 and frozen for later analysis showed the highest TCDD levels (800 ng/kg). It remains to be determined whether the present TCDD levels reflect residues from waste disposal in the past, or are being affected by current releases. It is noted that plants manufacturing 2,4,5-trichlorophenol were in operation until 1979 on the Saginaw River (upstream of Saginaw Bay, Lake Huron) and until 1974 in Niagra Falls, NY. Meetings concerning the problem have been held between Canadian and United States representatives, but no course of action has yet been formulated.

81-1277. Heinz, D. J.; Carlson, M. K.; Tabusa, R. S. (99-193 Aiea Heights Dr., Aiea, HI 96701) **Annual report of the experiment station of the Hawaiian Sugar Planters' Association. 1979.** *Annu. Rep. Exp. Stn. Hawaiian Sugar Plant. Assoc.* 79 pp.; 1980.

The Annual Report of the Hawaiian Sugar Planters' Association Experiment Station is presented. Activities reported include breeding and selection, environmental studies, irrigation, fertilization, soil and nutrition studies, growth and metabolism studies, pest control, cane and juice processing, and energy-related projects. Both weed and insect control studies were performed. Experiments on sugar yield with ametryne, atrazine, and diuron demonstrated that none of the herbicides, alone or in combinations, induced phytotoxicity or reduced yield. Soil degradation of the rodenticide diphacinone is currently under investigation. Preliminary results indicate that CO_2 is rapidly released from Hilo and Kappa soils. It is suggested that diphacinone is not very stable in soil and that soil type is not a major factor in diphacinone degradation. No detectable residues of heptachlor in sugar cane were found in experiments with heptachlor (applied at rates of 0.25 lb/acre, 0.2825, kg/ha; or 0.5 lb/acre, 5.65 kg/ha) to prevent ant damage. Dursban (chlorpyrifos) residues of 0.016 ppm were found in the bagasse of sugar cane after applications of Dursban to mill wash water. Dursban residues were not detected in whole cane samples but, after processing, residues in dry bagasse were concentrated 8-10-fold. Dursban is not registered for use on sugar cane and further studies on these residues are currently being performed.

81-1278. Harding, G. C.; Vass, W. P.; Drinkwater, K. F. (Mar. Ecol. Lab., Dep. Fish. & Oceans, Bedford Inst. Oceanogr., Dartmouth, Nova Scotia B2Y 4A2, Canada) **Importance of feeding, direct uptake from seawater, and transfer from generation to generation in the accumulation of an organochlorine (*p,p'*-DDT) by the marine planktonic copepod *Calanus finmarchicus*.** *Can J. Fish. Aquat. Sci.* 38(1): 101-119; 1981 (90 references).

The accumulation of an organochlorine by the marine copepod *Calanus finmarchicus*, through feeding on contaminated phytoplankton, ^{14}C-*p,p'*-DDT- labeled *Thalassiosira weisflogii*, was measured. At normal den-

sities, ≈ 60 μg C/ℓ, the copepod retained 60-70% of the DDT ingested following gut egestion, but under bloom conditions, ≈ 600 μg C/ℓ, retained as little as 10%. These results allow incorporation of feeding and generation transfer terms into an earlier model of DDT flux between seawater and planktonic crustaceans. Model simulations indicate that it is not necessary to invoke direct uptake from seawater to arrive at published levels of ΣDDT in copepods, even when the lowest experimental DDT feeding efficiencies are used. It is predicted that the potential for rapidly developing *Calanus* to accumulate DDT from generation to generation will reach an equilibrium concentration after 12 generations but that an alternating equilibrium of generations will occur within 4 generations in a 2 season temperature environment. (Author abstract by permission)

81-1279. Anderson, J. R.; Stephenson, G. R.; Corke, C. T. (Dep. Environ. Biol., Univ. Guelph, Guelph, Ontario N1G 2 W1, Canada) **Atrazine and cyanazine activity in Ontario and Manitoba soils.** *Can. J. Soil Sci.* 60(4): 773-781; 1980 (16 references).

A growth room bioassay, with barley (*Hordeum vulgare* L. Fergus) as the indicator plant, established that atrazine and cyanazine were nearly twice as active in 5 Ontario soils as in 4 Manitoba soils examined. In most soils, a higher rate of cyanazine application was required to establish activity equal to atrazine. Adsorption and desorption studies indicated that up to 85% of the initial application of either herbicide was potentially available in the solution phase in some Ontario soils, whereas only 20-50% was available in the solution phase of Manitoba soils at equilibrium. This 2- to 4-fold difference in sorption could be a major reason for the large differences between Ontario and Manitoba soils in either atrazine or cyanazine activity. Atrazine degradation was negligible in non-sterile soil over a 3-wk period, whereas over half of the cyanazine applied was degraded to 2 metabolites in this same time period. Thus, differences in degradation rates could contribute to the lower activity of cyanazine compared to atrazine observed in most soils. (Author abstract by permission)

81-1280. Knight, G. C.; Walker, C. H.; Cabot, D. C.; Harris, M. P. (Dep. Physiol. & Biochem., Univ. Reading, Whiteknights, Reading, Berkshire RG6 2AJ, England) **The activity of two hepatic microsomal enzymes in sea birds.** *Comp. Biochem. Physiol. C* 68(2): 127-132; 1981 (18 references).

Hepatic microsomal monooxygenase and epoxide hydratase activities were determined in species of fish-eating sea birds, using organochlorine substrates (dieldrin, *p,p'*-DDE, and PCBs). Most epoxide hydratase activities were lower than those in the male rat and fell within the general range for birds. All fish-eating species except the puffin (*Fratercula artica*) had much lower monooxygenase activities (male rat = 1) were calculated from these data to facilitate comparison with the literature; values for puffin were similar to those for the rat, but other fish-eating species gave low values, comparable with those of fish. These low monooxygenase activities may result in slow metabolism of certain pollutants *in vivo*. (Author abstract by permission)

81-1281. Anonymous **Bacteria can eat toxic chemicals.** *Conservationist* 35(4): iii; 1981.

The possible use of bacteria to dispose of some unwanted toxic chemicals is reported. Genetic engineering studies are being carried out to develop microorganisms capable of transforming toxic chemicals (such as DDT and 2,4-D) into easily disposable products. Gene-to-bacterium transfer techniques are being used to program bacteria with the traits necessary to ingest toxic chemicals. As an example, researchers have isolated and transferred the genes that allow the soil microorganism *Psuedomonas* (which uses 2,4-D as its carbon source) to ingest 2,4-D. The bacteria then become an innocuous product or may even be converted to marketable items such as fertilizer.

81-1282. Klecka, G. M. (Univ. Texas, Austin, TX) **Bacterial degradation of dibenzo-*p*-dioxin and chlorinated dibenzo-*p*-dioxins and effect of substituted catechols on metapyrocatechase $_{TOL}$ from *Pseudomonas putida*.** *Diss. Abstr. Int. B* 41(7): 2488; 1981.

Pseudomonas sp. NCIB 9816, strain 11, when grown on salicylate in the presence of dibenzo-*p*-dioxin, accumulated *cis*-1,2-dihydroxy-1,2-dihydrodibenzo-*p*-dioxin and 2-hydroxydibenzo-*p*-dioxin in the culture media. Each metabolite was isolated in crystalline form and identified by conventional chemical techniques. Crude cell extracts, prepared from the parental strain grown with naphthalene, oxidized *cis*-1,2-dihydroxy- 1,2-dihydrodibenzo- *p*-dioxin under both aerobic and anaerobic conditions to 1,2-dihydroxydibenzo- *p*-dioxin. Further degradation of this metabolite was not detected. Whole cells of a strain of *Beijerinckia*, grown with succinate and biphenyl, oxidized dibenzo-*p*-dioxin and several chlorinated dioxins. The rate of oxidation of the chlorinated dibenzo-*p*-dioxins decreased with an increasing degree of chlorine substitution. A mutant strain, B8/36, of *Beijerinckia* oxidized dibenzo-*p*-dioxin to *cis*-1,2-dihydroxy-1,2-dihydrodibenzo-*p*-dioxin. The mutant organism also oxidized 2 monochlorinated dibenzo-*p*-dioxins to *cis*-dihydrodiols. No metabolites were detected from two dichlorinated dibenzo-*p*-dioxins. Growth of the parent strain of *Beijerinckia* on succinate was inhibited when 0.05% dibenzo-*p*-dioxin was present in the culture medium. Resting cell suspension of the parent organism, previously grown with succinate and biphenyl, oxidized dibenzo-*p*-dioxin to a compound identified as 1,2-dihydroxydibenzo- *p*-dioxin. Further degradation of this

metabolite was not detected, as the compound was found to be a potent mixed-type inhibitor of two ring-fission oxygenases present in this organism. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 8100922)

81-1283. Forrest, M.; Lord, K. A.; Walker, N.; Woodville, H. C. (Chem. Liaison Unit, Rothamsted Exp. Stn., Harpenden, Hertfordshire, England) **The influence of soil treatments on the bacterial degradation of diazinon and other organophosphorus insecticides.** *Environ. Pollut. Ser. A* 24(2): 93-104; 1981 (11 references).

Experiments were conducted in which bacterial degradation of several organophosphorus insecticides was correlated to soil treatment. A variety of soils were subjected to repeated applications of pesticides. Diazinon was rapidly degraded; however, parathion, phorate, chlorfenvinphos, pirimiphos ethyl, pirimiphos methyl or carbofuran were not degraded. Several soil treatment procedures were conducted to attempt to stop the degradation of diazinon, mainly chloroform fumigation, pasteurizing, alternate wetting and drying, or freezing and thawing. None of these techniques reduced degradation. Bacterial analyses were conducted on the soil; a species of *Flavobacterium*, which was able to degrade diazinon, was isolated. *In vitro* degradation of parathion and diazinon by the *Flavobacterium* was observed. In soil experiments only diazinon was degraded. It is postulated that soil adsorption of parathion prevents microbial breakdown of parathion.

81-1284. Cowan, A. A. (Freshwater Fish. Lab., Pitlochry, Perthshire PH16 5LB, Scotland) **Organochlorine compounds in mussels from Scottish coastal waters.** *Environ. Pollut. Ser. B* 2(2): 129-143; 1981 (24 references).

Mussels *(Mytilus edulis)* were collected in 1977 from 118 sampling sites along the mainland coast of Scotland and the island of Shetland and used as biological indicators of the pollution of these waters by pesticides and PCBs. Organochlorines were determined in the samples by gas chromatography-mass spectrometry. The coastline was divided into 10 areas and the mean concentrations were determined for each area. The mean concentration of α-HCH (α-BHC) ranged from < 6 to < 7 ng/g dry wt; γ-HCH (lindane), from < 6 to < 11 ng/g; HCB (hexachlorobenzene), from < 6 to 19 ng/g; ΣDDT, from < 18 to 123 ng/g; dieldrin, from 6 to 178 ng/g; and PCB, from 60 to 646 ng/g. Data were compared with results reported for other countries. Scottish mussels were found to have the highest dieldrin content, 7th highest ΣDDT, and 5th highest PCB. It was concluded that mussels are useful organisms for identifying areas significantly contaminated by organochlorine compounds.

81-1285. Harder, H. W.; Christensen, E.; Matthews, J. R.; Bidleman, T. F. (Belle W. Baruch Inst. Mar. Biol. Coastal Res., Columbia, SC 29208) **Rainfall input of toxaphene to a South Carolina estuary.** *Estuaries* 3(2): 142-147; 1980 (23 references).

Rainfall was collected within the North Inlet estuary, a high salinity salt marsh near Georgetown, South Carolina. The estuary is not near human habitation or industrial development, and receives little fresh water input other than rainfall. Rainwater was extracted with dichloromethane, refluxed with hexane, and cleaned up with alumina column chromatography. Toxaphene levels in rain increased from near background levels in late spring to > 150 ng/kg in midsummer. These high levels correlated with increased usage of toxaphene during these months. The mean toxaphene content of 60 rain samples was 45 ng/kg. Other chlorinated hydrocarbons occasionally identified included PCBs and DDT. Residues of toxaphene were identified in oyster, blue crab and mummichog collected from the estuary, at levels of 30-60 μg/kg.

81-1286. Zell, M.; Ballschmiter, K.* (Abt. Anal. Chem., Univ. Ulm, D-7900 Ulm-Donau, BRD) **Baseline studies of the global pollution. III. Trace analysis of polychlorinated biphenyls (PCB) by ECD glass capillary gas chromatography in environmental samples of different trophic levels.** *Fresenius Z. Anal. Chem.* 304(5): 337-349; 1980 (66 references).

The PCB-pattern of biological environmental samples of different trophic levels (fish, bird, man) and geographic areas (Alps, North Sea, North Atlantic) as seen by high-resolution glass capillary gas chromatography with electron capture detection is presented. The most evident variation of the pattern compared to a best fit simulation by technical mixtures is found for warm blooded species (eggs of birds and human milk). Only 1 trichloro-, but 9 tetrachloro-biphenyls and 55 penta- to octachlorobiphenyls have been identified as PCB-components in biological samples. Compounds with 4,4'-disubstitution degrade very slowly, if at all (1,4-recalcitrance principle). Single component analysis of PCB in marine samples using glass capillary gas chromatography needs the preseparation from the ubiquitous polychloroterpenes (toxaphene, polychlorocamphene) and the DDT-group. Both complex mixtures can be separated successfully by adsorption chromatography on Florisil. Quantitation of PCB, as a sum, has been done by using recalcitrant diagnostic components and PCB-Clophen A60 as the reference standard. (Author abstract by permission)

81-1287. Raghu, K.; Mendes, M. G.; Murthy, N. B. K.; Ferriera, J. (Biol. & Agric. Div., Bhabha At. Res. Cent., Bombay 400085, India) **Hexachlorocyclohexane and carbaryl residues in groundnut.** *IAEA-218 Conf. Rep.* 7804117: pp. 3-11; 1979 (15 references).

Pesticide residues in groundnut were examined. Twenty plants grown in greenhouses were exposed to 10 kg hexachlorocyclohexane (HCH; BHC) dust/acre (10 kg/0.405 ha), with 45 mCi/mmol ^{14}C-lindane added to the dust. Another group of plants was exposed to labeled or unlabeled carbaryl at 3 kg/ha. Plants were harvested and kept in sunlight for 1 day. The pods were picked, then dried for an additional 5-7 days in the sunlight. Some nuts were also deodorized and bleached. HCH residues were determined by gas chromatography. Carbaryl was determined by thin layer chromatography. The oil extracted from HCH treated plants contained the β-isomer in higher quantities than the other isomers. Drying procedures did not reduce the ^{14}C activity. Deodorization removed 86%, 94% and 56% of α-, γ(lindane)- and β-isomers, respectively. Oil from the carbaryl test group contained carbaryl metabolites, but no carbaryl. Bleaching and refining removed 76% of the ^{14}C-activity; deodorization removed 23%.

81-1288. Zayed, S. M. A. D.; Mansour, S. A.; Mostafa, I. Y.; Hassan, A. (M. E. Reg. Radioisot. Cent., Dokki, Cairo, Egypt) **Determination and characterization of carbaryl residues in maize products.** *IAEA-218 Conf. Rep.* 7804117: pp. 13-19; 1979 (7 references).

^{14}C-Carbaryl was applied to maize at the rate of 6.7 mg/plant. Unlabeled carbaryl was applied to a second plot at 75 mg/plant. Ears and green parts were collected after 14 days. Residues were determined in soft grains, roasted ears and green parts. Other plants were left to dry in the field; residues were analyzed in the oil, germ and flour. Carbaryl levels were 0.020 ppm in flour and 1.97 ppm in green leaves. Oil had the highest concentration (7.1 ppm). Soft grains contained 0.202 ppm; roasted grains, 0.110 ppm; and germ, 0.155 ppm. The determination of carbaryl residues in other food products is recommended.

81-1289. Qureshi, M. J. (Nucl. Inst. Agric. & Biol., Faisalabad, Pakistan) **^{14}C-Carbaryl residues in cotton seed products.** *IAEA-218 Conf. Rep.* 7804117: pp. 21-27; 1979 (12 references).

Groups of 5 field grown cotton plants were sprayed or dusted with ^{14}C-carbaryl, at 6.6 mg/plant, 4 times, at monthly intervals. At harvest seeds were collected and subjected to ginning. ^{14}C-Carbaryl was determined in the seed, oil and seed cake. In another experiment, 5 plants were grown in pots containing carbaryl-treated soil. ^{14}C-Activity in leaves and stems was radioassayed. Thin layer chromatography was used to identify carbaryl and characterize its metabolic products. ^{14}C-Residues were found to be 0.08-0.09, 0.23-0.30 and 0.5 ppm in the seed, oil and seed cake, respectively. Four compounds were isolated from the oil; 2 were identified as carbaryl and 1-naphthol. In the soil studies, residues taken up did not exceed 0.3 ppm after the first wk, and declined to 0.1 ppm after 5 wk. In general, it is concluded that the residues found in these products are not likely to present a toxicological hazard.

81-1290. Lee, S. R.; Kang, S. Y.; Kim, Y. H. (Environ. Chem. Lab., Korea At. Energy Inst., Seoul, Korea) **Appearance of organochlorine insecticide residues in vegetable oils produced in Korea.** *IAEA-218 Conf. Rep.* 7804117: pp. 39-42; 1979 (7 references).

Organochlorine residues were determined in refined vegetable oils obtained from local markets in the major cities of Korea in 1976. A total of 43 samples of rapeseed, rice bran, sesame, perilla and corn oils were analyzed by gas chromatography. Organochlorine insecticide residues varied depending on the pesticide, oil source and production area. DDT was detected in almost all samples; the highest level was 0.134 ppm in one sesame sample. ΣBHC levels ranged from 0.001 to 0.075 ppm. Heptachlor ranged from not detectable (ND) to 0.052 ppm. Levels for aldrin, dieldrin and endrin were ND-0.001, ND-0.057 and ND-0.112 ppm, respectively. It was concluded that the residues found were generally below the tolerance limits, and that a total diet survey would be required to assess their toxicological impact.

81-1291. Lee, S. R.; Kang, S. Y.; Kim, Y. H. (Environ. Chem. Lab., Korea Atomic Energy Res. Inst., Seoul, Korea) **Behavior of nitrofen, alachlor, and butachlor applied to oil-bearing crops in Korea.** *IAEA-218 Conf. Rep.* 7804117: pp. 43-50; 1979 (6 references).

The behavior of the herbicides nitrofen, alachlor and butachlor applied to oil-bearing rape, soybean and paddy rice crops was assessed. The 3 crops were grown under field conditions. The recommended amounts of nitrofen (200 g/10 a), alachlor (53-109 g/10 a) and butachlor (180 g/10 a) were applied to the soil. Conventional Korean agricultural practices were employed. Electron capture detection-gas chromatography was used to determine residues in seed samples and soil samples taken from the upper 10 cm layer. Herbicide residues declined considerably 2 wk after application, and slowly thereafter. No herbicide residues were found in the seeds. It was concluded that these 3 herbicides were unlikely to contribute to serious environmental pollution problems under regular patterns of agricultural practice.

81-1292. Adonako, D.; Owusu-Manu, E. (Cocoa Res. Inst., Tafo, Ghana) **Propoxur residues in cocoa beans.** *IAEA-218 Conf. Rep.* 7804117: pp. 51-57; 1979 (9 references).

Field studies were carried out to determine the magnitude of propoxur residues in cocoa under normal agricultural practive in Ghana and the effects of processing

methods on residue levels. Plots were treated at the recommended rate of 210 g AI/ha, and twice the recommended rate at monthly intervals from July to October. Pods were harvested randomly at 1, 10 and 20 days. Cured beans were analyzed for propoxur residues by gas chromatography. No residues were found in 3 of the 9 bean samples, 5 contained 0.01 ppm, and 1 contained 0.03 ppm. A radiotrace study with ^{14}C-labeled propoxur showed low uptake of the chemical from deposits on outer pod surfaces. No relationship was found between residues and harvesting time, cocoa type or rate of application. It was concluded that use of propoxur during cocoa farming is unlikely to constitute any toxicological or nutritional hazard.

81-1293. Qureshi, N. J. (Nucl. Inst. Agric. & Biol., Faisalabad, Pakistan) **Isotopic tracer aided studies on the fate of leptophos residues in cotton seed and its products under Pakistan conditions.** *IAEA-218 Conf. Rep.* 7804117: pp. 59-62; 1979 (7 references).

Radiotracer experiments were carried out under Pakistan field conditions to determine the fate of ^{14}C-leptophos applied foliarly to cotton plants. ^{14}C-Phenyl leptophos (6.6 mg/plant) was applied 4 times at 10 day intervals. Plants were allowed to mature before harvest. ^{14}C-Activity in cotton seed, oil and seed cake was determined by liquid scintillation counting. The mean values for leptophos residues in the cotton seed, oil and seed cake were 0.263, 1.10 and 0.66 ppm, respectively. It is suggested that the high values in the oil may be related to the strong lipophilic character of leptophos and some of its metabolites.

81-1294. Kakar, K. L.; Nath, A.; Verma, T. D. (Himachal Pradesh Krishi Visha Vidyalaya, Solan, Himachal Pradesh 173213, India) **Efficacy and persistence of different granular insecticides against maize stem-borer, *Chilo partellus* Swinhoe.** *Indian J. Agric. Sci.* 50(9): 712-715; 1980 (16 references).

During studies of test the effectiveness of the insecticides fenthion, quinalphos, disulfoton, carbofuran, fenitrothion, fensulfothion, carbaryl + BHC, aldicarb and phorate on the maize stem-borer, the degradation rates in soil, residual toxicity, and residues in crop at harvest were measured. The pesticides were applied as furrow treatments or side-dressings at rates of 2 g AI/m row (carbaryl + BHC, aldicarb and phorate) or 1 g AI/m row (all others). Residues from soil samples, from the 0-15 cm layer collected at 0, 55, 81 and 172 days after application, and residues extracted from maize at harvest were assayed for toxicity to *Drosophila melanogaster*. The assay was used to classify residue levels as ND (non-detectable), BTL (below tolerance level) or ATL (above tolerance level). At 55 days, fensulfothion, aldicarb, phorate and disulfoton were ND in soil. At 81 days, aldicarb, phorate and disulfoton residues reappeared in the samples as determined by *D. melanogaster* assays. Carbaryl + BHC, fensulfothion, fenitrothion, carbofuran and quinalphos were ND. At 172 days only disulfoton was detected in soil samples. When pesticides were applied as a side-dressing aldicarb levels in harvested maize were ND and all others were BTL. After furrow application, phorate, quinalphos and fensulfothion levels were ND, carbaryl + BHC levels were BTL, and all others were ATL.

81-1295. Mukherjee, D.; Roy, B. R.; Chakraborty, J.; Ghosh, B. N. (Dep. Prev. & Soc. Med., All India Inst. Hyg. & Public Health, Calcutta, India) **Pesticide residues in human foods in Calcutta.** *Indian J. Med. Res.* 72(10): 577-582; 1980 (10 references).

Pesticide concentrations were investigated in 390 raw samples of foodstuffs and in 10 water samples. Positive test results were obtained for 95 samples (23.7%). Highest detection rates (30%) occurred in animal products (meat, milk and fish). Vegetables and grains tested positive in 24% and 26.3% of the cases, respectively. Other positive findings were in condiments (20%), fats and oils (10%), and fruits (10%). The 10 water samples were taken from corporation water supplies, Ganges waters, deep tube-well water, shallow well water and ponds. None of the drinking water samples were positive. Both pond samples were positive; one sample contained malathion at 1.6 ppm and the other contained DDT at 1.5 ppm. High concentrations of DDT and lindane (2.1 and 2.6 ppm, respectively) were found in cereals and pulses. Malathion was present at 2.6 ppm in vegetables. The detection rate for food samples collected during the winter (31.3%) was significantly different than that for food samples collected during the rainy season (16.6%).

81-1296. Mukherjee, D.; Ghosh, B. N.; Chakraborty, J.; Roy, B. R. (Dep. Prev. & Soc. Med., All India Inst. Hyg. & Public Health, Calcutta, India) **Pesticide residues in human tissues in Calcutta.** *Indian J. Med. Res.* 72(10): 583-587; 1980 (14 references).

Human fat, liver, kidney, spleen and brain samples were taken from 100 individuals who died accidentally or by non-poisoning suicide/homicide from November 1975-October 1976 in Calcutta, India. Occupational exposure to pesticides and history of chronic illness were considered. Pesticides were found in 27% of the persons tested. Residues were detected in 16.5% of the 0-20 yr age group, 29.8% of the 21-40 yr age group, 30.7% of the 41-60 yr age group, and 22.2% of the > 61 yr age group. The highest mean concentration of DDT (0.66 ppm) was found in the 21-40 yr age group; the highest value for lindane (1.5 ppm) was found in the > 61 yr group. The overall mean concentrations of DDT and lindane in fatty tissue were 0.46 and 0.45 ppm, respectively. Pesticide detection rates for fat tissue were highest (42.1%) in the 31-40 yr old age group. No pesticide was detected in the spleen or brain tissues

studied. A total of 36 tissue samples gave positive results for pesticide residues; 22 were fat samples, 9 were kidney tissues and 5 were liver tissues. No malathion residues were found in adipose tissue samples. Of the 11 DDT positive tests, 10 were from adipose tissues; 12 of 14 positive lindane tests were from adipose tissues. A total of 27 individuals and 36 tissue samples were positive for pesticide residues, indicating 5 persons had detectable levels of pesticides at more than one tissue sample site. The levels were higher in the winter, and lowest during the rainy season.

81-1297. Dardanelli, C.; Salvadori, P.; De Rosa, F.; Rivali, F.; Polidori, G.; Capriotti, L. (Lab. Chim. Prov. Ig., Pesaro, Italy) **Gli organo clorurati nell'ambiente. [Organochlorines in the environment.]** *Inquinamento* 22(12): 41-43; 1980 (9 references) (Italian).

Organochlorine pesticides and PCBs were determined in sea and river water samples from different sites in Italy in 1978 and 1979. In sea water samples collected at 6 different sites at different dates, the DDT levels ranged from traces (ND) to 6 ng/l in all samples except one, in which 46.5 ng/l was detected. PCB levels ranged from ND to 309.5 ng/l. DDE (2-77 ng/l) was found in some samples. Except for one sample (4.5 ng/l), DDD (TDE) was found in trace amounts, or not at all. The DDT and PCB levels found in the water of the Foglia River were 0.2-3.5 μg/l and 5-23 μg/l, respectively. Market samples of salt-water fish contained 2-25 μg/kg DDT, 55-390 μg/kg PCBs, 6-154 μg/kg DDE, and ND-39 μg/kg DDD.

81-1298. Fletcher, C. L.; Kaufman, D. D.* (Pestic. Degradation Lab., Agric. & Environ. Qual. Inst., USDA, Beltsville, MD 20705) **Effect of sterilization methods on 3-chloraniline behavior in soil.** *J. Agric. Food Chem.* 28(3): 667-671; 1980 (24 references).

The persistence and degradation of 3-[U-^{14}C]chloroaniline (3-CA) was examined in nonsterile, autoclaved and potassium azide, mercuric chloride, and ethylene oxide treated, Hagerstown silty clay loam. Treatments were monitored for ^{14}C volatilization, the formation of organosoluble products, and soil-bound residues. Highest levels of ^{14}C volatilization occurred from autoclaved and potassium azide treated soils, whereas lower ^{14}C volatilization occurred from nonsterile and mercuric chloride and ethylene oxide treated soils. ^{14}C Volatilization from autoclaved and potassium azide, mercuric chloride, and ethylene oxide treated soils occurred primarily as 3-[^{14}]CA, whereas both $^{14}CO_2$ and 3-[^{14}C]CA were evolved from nonsterile soil. Organosoluble products accounted for 22-31% of the ^{14}C recovered, whereas soil binding accounted for 34-80% of the total ^{14}C applied. The distribution of ^{14}C in organosoluble degradation products varied with each treatment. Alkaline extraction of the soil-bound residues released 5-7% of the total ^{14}C applied. Distribution of the residual ^{14}C in fulvic and humic acids and humin soil organic matter fractions varied with the soil sterilization method. (Author abstract by permission of the American Chemical Society)

81-1299. McEwen, J.; Bardner, R.; Briggs, G. G.; Bromilow, R. H.; Cockbain, A. J.; Day, J. M.; Fletcher, K. E.; Legg, B. J.; Roughley, R. J.; Salt, G. A.; Simpson, H. R.; Webb, R. M.; Witty, J. F.; Yeoman, D. P. (Rothamsted Exp. Stn., Harpenden, Hertshire AL5 2JQ, England) **The effects of irrigation, nitrogen fertilizer and the control of pests and pathogens on spring-sown field beans (*Vicia faba* L.) and residual effects on two following winter wheat crops.** *J. Agric. Sci.* 96(1): 129-150; 1981 (34 references).

In experiments to determine the interactions of various paired combinations of irrigation, nitrogen fertilizers, aldicarb, fonofos, dieldrin, benomyl, permethrin, fenitrothion, and pirimicarb, aldicarb residues were determined in bean plants. Toxic residues of aldicarb were determined after conversion of aldicarb and aldicarb sulfoxide to aldicarb sulfone and subsequent column cleanup. At 8 wk after sowing in the first year, aldicarb residues in leaves and stems were 30 μg/g fresh wt. Immediately before harvest residues were 3.5 μg/g in unirrigated crops and 4.0 μg/g in irrigated crops. In year 2, aldicarb residues were 10 μg/g at 10 wk, 4 μg/g at 16 wk and 2 μg/g at 21 wk after sowing.

81-1300. Roberts, J. L., Jr.; Sawyer, D. T. (Dep. Chem., Univ. California, Riverside, CA 92521) **Facile degradation by superoxide ion of carbon tetrachloride, chloroform, methylene chloride, and *p,p'*-DDT in aprotic media.** *J. Am. Chem. Soc.* 103(3): 712-714; 1981 (17 references).

Studies are reported which indicate that CCl_4, $CHCl_3$, CH_2Cl_2, CH_3Cl and *p,p'*-DDT react rapidly with superoxide ion in dimethyl formamide (DMF) and dimethyl sulfoxide (Me_2SO). The overall reactions are multistep processes, and the overall reactant and product stoichiometries are summarized. The second-order rate constants are also summarized. The relative rates of reaction for the primary rate-limiting step follow the order $CCl_4 > CH_3Cl_3 > p,p'$-DDT $> CH_3Cl > CH_2Cl_2$. The stoichiometry of the reaction of *p,p'*-DDT indicates that only 2 of the 3 alkylchloro atoms are removed. Therefore, there may be a dehydrohalogenation to give a chloro-substituted alkene subsequent to the first step.

81-1301. Koch, B. L.; Covey, R. P., Jr.; Haglund, W. (Tree Fruit Res. Cent., Washington State Univ., Wenatchee, WA 98801) **Effect of soil fumigation on the early growth and production of Delicious apple trees.** *J. Am.*

Soc. Hortic. Sci. 105(6): 887-890; 1980 (15 references).

74-83-9 (15 references).

Growth and fruit production in replanted trees in fumigated soils were investigated. Arsenic levels in soil (30-60 cm) at the time of replanting were 31-42 ppm for orchard field 1, and 74-100 ppm, 45-61 ppm and 29-45 ppm for fields 2, 3 and 4, respectively. Field 4 was the control. Before replanting, single, 45 cm deep injections of 454 g of 98% methyl bromide were applied to each tree site for soil fumigation. Four soil samples from 0-30 cm, 30-60 cm and 60-90 cm depths were collected from 6-8 sampling sites in each orchard for residue and nematode determinations. Tree growth and productivity were measured for 6-8 yr after replanting and significant increases were observed between experimental and control fields. Tree growth in fumigated plots was not stimulated in year 1. It is suggested that residual levels of methyl bromide may have adversely affected initial tree growth. Arsenic levels were not considered excessive and were assumed to have little influence on tree growth.

81-1302. Sollins, P.; Cromack, K., Jr.; McCorison, F. M.; Waring, R. H.; Harr, R. D. (Dep. For. Sci., Sch. For., Oregon State Univ., Corvallis, OR) **Changes in nitrogen cycling at an old-growth Douglas-fir site after disturbance.** *J. Environ. Qual.* 10(1): 37-42; 1981 (40 references).

Effects of disturbance on the N cycle in a 450-yr-old Douglas-fir stand *(Pseudotsuga menziesii)* were studied in an experiment in which herbicides [monosodium methanearsonate (MSMA) and Round-up (glyphosate)] were used to kill all vegetation while minimally disturbing the litter layer and soil. Nitrogen concentration in falling foliage was greater on the treated area than on a control area, as was soil moisture. Nitrate and Kjeldahl N concentrations in the soil solution were greater on the treated than on the untreated area, but only at or below the bottom of the rooting zone (≥ 1 m depth). On the untreated area, nitrate was present in solution in significant amounts only at the 2 m depth. (Author abstract by permission)

81-1303. McDowell, L. L.; Willis, G. H.; Murphree, C. E.; Southwick, L. M.; Smith, S. (Sedimentat. Lab., Agric. Res., SEA, USDA, Oxford, MS) **Toxaphene and sediment yields in runoff from a Mississippi Delta watershed.** *J. Environ. Qual.* 10(1): 120-125; 1981 (14 references).

Toxaphene (chlorinated camphene) and sediment concentrations in runoff from a 15.6 ha watershed, planted to continuous cotton (*Gossypium hirsutum* L.), were measured from 1973 through 1975 to determine the toxaphene and sediment yields and to define the major mode of toxaphene transport. The watershed, consisting of Sharkey silty clay soil (Vertic Haplaquepts), had been landformed to a mean slope of 0.2%. Measurements indicated a linear relationship between toxaphene yield and sediment yield in runoff. Sediment yields were 28.9, 26.3 and 13.4 metric tons/ha in 1973, 1974 and 1975, respectively, when annual rainfall was 37, 50 and 22 cm above the 30-yr average (125 cm). Although no toxaphene was applied in 1973, the residual toxaphene concentration in the soil from previous applications was 3.5 μg/g. Toxaphene yield in 1973 was 117 g/ha. Toxaphene yields in 1974 and 1975, when 10.0 and 11.2 kg/ha of toxaphene were applied, were 97 and 54 g/ha, respectively, amounting to only 1 and 0.5%, respectively, of the amounts applied. In 1974, 93% of the toxaphene yield was attached to the sediments and only 7% was transported in solution. Toxaphene and sediment yields were greatest during the spring tillage-planting-cultivating period, but toxaphene concentrations in runoff and sediment were greatest during the summer application period. Improved erosion control practices are needed in the Delta to reduce the loss of valuable topsoil and to reduce the water pollution potential from sediment and toxaphene. (Author abstract by permission)

81-1304. Shariatpanahi, M.; Anderson, A. C.; Abdelghani, A. A.; Englande, A. J.; Hughes, J.; Wilkinson, R. F. (Dep. Environ. Health Sci., Tulane Univ., Sch. Public Health & Trop. Med., New Orleans, LA) **Biotransformation of the pesticide sodium arsenate.** *J. Environ. Sci. Health B* 16(1): 35-47; 1981 (11 references).

The kinetics of sodium arsenate biotransformation by bacteria under aerobic conditions was investigated. Pure cultures of 5 bacterial species were employed using a mineral salt and limited carbon source medium. Concentrations of arsenate were 10 μg/ml and 100 μg/ml. The rate of biodegradation of the parent compound was described by a first order composite exponential equation. Rates of production of metabolites arsenite, monomethylarsine, dimethylarsine and trimethylarsine were also described by a first order exponential equation. It is noted that the bacteria metabolized arsenate to arsenite and volatile methylarsines. Although the arsenites were more toxic than arsenate, they were ultimately biotransformed to volatile methylarsines under aerobic conditions. Arsenate at 100 μg/ml had minimal toxicity on the microbes in the study, and volatilization of methylarsines was noted. It is suggested that soil microorganisms may enhance the dissipation of arsenates from the soil surface.

81-1305. Grover, R.; Kerr, L. A. (Herbic. Behav. Environ. Sect., Res. Stn., Agric. Canada, Regina, Saskatchewan S4P 3A2, Canada) **Evaluation of polyurethane foam as a trapping medium for herbicide vapor in air monitoring and worker inhalation studies.** *J. Environ. Sci. Health B* 16(1): 59-66; 1981 (16 references).

The use of polyurethane foam as a trapping medium for atmospheric residues of butyl esters of 2,4-D and triallate is evaluated. Small plugs of polyurethane foam were evaluated for trapping several commonly used herbicides to assess their potential as an adsorbent for

worker inhalation studies, at flow rates commensurate with the standard, battery operated, portable personal monitors. A single, 45 × 50 mm polyurethane foam plug retained 99-100% of the evaporated n-butyl ester of 2,4-D at flow rates in the range of 1 to 50 l/min over a 24 hr period. The ester was readily desorbed from the foam plugs after soxhlet extraction with n-hexane for 2 hr, with total recoveries at 1-10 μg from 92-115%. The use of foam plugs should allow at least a 10-fold increase in sample volume over a 24 hr period, as compared to earlier studies using solid adsorbents such as XAD-resins or silica gel. It was concluded that polyurethane foam an efficient and simple trapping medium for the accumulation collection of herbicide vapor from an air stream over time.

81-1306. Fahey, J. W.; Caplan, J. A. (Borriston Lab. Inc., Temple Hills, MD 20031) **New methodology for the rapid detection of protein degradation in activated sludge.** *J. Environ. Sci. Health B* 16(1): 67-73; 1981 (5 references).

A technique for monitoring the degradation of protein in activated sludge by measuring the enzymatic release of a substrate-bound dye is reported. The insoluble protein Azocoll contains an absorbed red azo dye which is released into solution by the nonspecific activity of a wide variety of proteolytic enzymes. The sensitivity of the method was investigated by measuring the effects of an inhibitor on protein degradation. Mercuric chloride, a common anti-microbial agent, was added to activated sludge at increments up to 100 ppm to measure inhibition of protein degradation. In determinations made on activated sludge, the dry release from Azocoll was determined to be linear. The incubation time most suitable for lab analysis was 5 hr. The A-520 of released dye fell within the linear portion of the time course release curve. The advantages of this technique include its low operational cost, sensitivity, ease of execution and rapidity of response.

81-1307. Narain, N. K.; Lewis, C. C.; Latheef, M. A. (Dep. Chem., Virginia State Univ., Petersburg, VA 21803) **Gas chromatographic estimation of malathion in seven vegetables.** *J. Environ. Sci. Health B* 16(1): 75-81; 1981 (10 references).

A simple, rapid method for routine analysis of malathion residues in vegetables is presented. The method involves extraction of plant material in ethyl acetate and injection into a GLC without additional cleanup. Recoveries were 90-94% from fortified vegetable samples, with the exception of tomato (recovery 66-77%). Residues on vegetables sprayed with malathion were then determined. Cabbage, cucumber, garden bush bean, okra, pepper, squash and tomato were grown in sandy clay loam soil. Malathion formulation (50% liquid) was sprayed at 2.75 lb/acre (3.12 kg/ha). Plants were sprayed to the point of run off. A total of 13 applications were made in the study plots. Fruits and foliage were collected 1 wk after final applications. Samples were frozen within 1 hr and stored at -10°C until processed for analysis. Foliage of tomato, squash and pepper showed relatively higher residues (0.01 ppm each) than the fruits of the same plants (0.00 ppm). Cucumber and okra had higher residues in fruit (0.07 and 0.03 ppm, respectively) than in foliage (0.00 ppm). It is concluded that dissipation of malathion is very rapid under environmental conditions in Virginia. Residue levels were below the tolerance limit of 8 ppm, and considerable safety for consumers is suggested.

81-1308. Kraus, J. F.; Mull, R.; Kurtz, P.; Winterlin, W.; Franti, C. E.; Kilgore, W.; Borhani, N. O. (Div. Epidemiol., Sch. Public Health, Univ. California, Los Angeles, CA 90024) **Monitoring of grape harvesters for evidence of cholinesterase inhibition.** *J. Toxicol. Environ. Health* 7(1): 19-31; 1981 (16 references).

A long-term (6 wk) monitoring study was carried out on 36 grape harvesters who were exposed to organophosphate pesticide residues following reentry into vineyards. Clinical effects were evaluated through physical examinations before and at the completion of the season. Red blood cell acetylcholinesterase (AChE) activity, plasma cholinesterase (PChE) activity, and urinary dialkyl phosphate excretion were monitored. Residues of dimethoate and dimethoate oxon, ethion and ethion dioxon, methomyl, naled, DDVP (dichlorvos), and phosalone on grape leaves were determined by gas chromatography. Blood ChE activity showed no pesticide-related depression throughout the study, and there was no clinical evidence of any health effects. Urinary metabolite data showed very slight absorption of ChE-inhibiting pesticides during harvest activity. The only pesticide residue detected on the grape leaves was ethion dioxon. It was concluded that the workers had been exposed to enzyme-inhibiting pesticides, but the levels were very low. The study design met with only partial success, due to the high mobility of workers, communication problems, and cultural factors. Suggestions are made for design of future studies to help insure a higher level of participation.

81-1309. Hay, A. (Author address not given) **Chlorinated dioxins and the environment.** *Nature (London)* 289(5796): 351-352; 1981 (4 references).

Biodegradation of polychlorinated dibenzodioxins (PCDDs) does not occur readily in the soil environment. Previous reports of biodegradation of TCDD (tetrachloro isomer) are noted to have estimated the TCDD half-life in soil at 230-320 days, depending on the soil microbial fauna. Recent evidence from Seveso indicates that TCDD residues in soil there have not changed in the 4 yr since the accident and that the half-life of TCDD may be in excess of 10 yr. Processes which lead to environmental contamination by PCDDs are reviewed. Alternatives to reduce the amounts of PCDDs produced by incineration are also discussed. A

new assay method for detecting small amounts of PCDD isomers in humans has been developed which requires only a 10 ml sample of blood plasma. This assay was used to detect PCDDs in workers exposed to pentachlorophenol (PCP) and is suggested to offer a method for monitoring PCDD levels in individuals and thereby lead to more rigorous health standards.

81-1310. Tanabe, S.; Tatsukawa, R. (Dep. Environ. Conserv., Ehime Univ., Matsuyama 790, Japan) **Chlorinated hydrocarbons in the North Pacific and Indian Oceans.** *Nippon Kaiyo Gakkaishi (J. Oceanogr. Soc. Jpn.)* 36(4): 217-226; 1980 (25 references).

The concentrations and distribution of DDT and its metabolites, HCH (BHC) isomers, and PCBs in the air and in surface waters of the North Pacific and Indian Oceans are reported. Samples were collected from 1975 to 1979. Air sampling was carried out continuously throughout survey cruises using Florisil columns, and water samples were collected from the sea surface in metal buckets. Gas chromatographic analyses were performed on the samples to determine concentrations. In water samples, general ranges were 0.1 to 1.0 ng/l for PCBs, 0.01 to 1.0 ng/l for ΣDDT, and 1.0 to 10.0 ng/l for ΣHCH. In air, ΣDDT ranged from 0.01 to 1.0 ng/m³ and ΣHCH from 0.1 to 10.0 ng/m³. PCB concentrations in water were slightly lower than those previously reported for the North Atlantic and North Sea, and ΣDDT concentrations were higher. High concentrations of ΣDDT and ΣHCH off the western coast of India and of ΣDDT off the coast of Central America suggest that large amounts of DDT and HCH are still used in the tropical zone. The fact that latitudinal distribution patterns of both pesticides are fairly similar for air and water suggests that their transport to the open ocean is predominantly via the atmosphere, and the distribution of the pesticides in that open area is determined by equilibrium partitioning between the air and surface waters.

81-1311. Hitchings, E. J.; Roberts, T. R. (Sittingbourne Res. Cent., Shell Biosci. Lab., Shell Res. Ltd., Sittingbourne, Kent ME9 8AG, England) **Degradation of the herbicide flamprop-methyl in soil.** *Pestic. Sci.* 11(6): 591-599; 1980 (6 references).

The degradation of the wild oat herbicide flamprop-methyl [methyl DL-*N*-benzoyl-*N*-(3-chloro-4-fluorophenyl)alaninate] in 4 soils has been studied under laboratory conditions using ^{14}C-labeled samples. The flamprop-methyl underwent degradation more rapidly than its analog flamprop-isopropyl. However, similar degradation products were formed, namely the corresponding carboxylic acid and 3-chloro-4-fluoroaniline. The latter compound occurred mainly as bound forms although evidence was obtained of limited ring-opening to give [^{14}C]carbon dioxide. The time for depletion of 50% of the applied herbicide was approximately 1-2 wk in sandy loam, clay and medium loam soils and 2-3 wk in a peat soil. (Author abstract by permission)

81-1312. Braun, H. E.; Ritcey, G. M.; Frank, R.; McEwen, F. L.; Ripley, B. D. (Prov. Pestic. Residue Test. Lab., Ontario Minist. Agric. & Food, Guelph, Ontario N1G 2W1, Canada) **Dissipation rates of insecticides in six minor vegetable crops grown on organic soils in Ontario, Canada.** *Pestic. Sci.* 11(6): 605-616; 1980 (12 references).

Dissipation rates of diazinon, endosulfan, leptophos, methamidophos, methomyl, parathion and pirimicarb were studied on 5 minor vegetable crops, including cos and head lettuce, endive, cauliflower and Chinese cabbage. Residues from foliar treatment generally followed an exponential rate of decline. The number of days for residues to drop to below acceptable tolerances was highly dependent on the magnitude of the initial residue; large variations in initial residues were observed between years, between insecticides, and between crop types. Residues of 5 insecticides and 2 fungicides used in furrow treatments for onions intended for pickling were determined in the onions at harvest and after pickling. Fensulfothion and fonofos levels were below the accepted tolerance of 0.1 mg/kg at harvest, while chlorfenvinphos, chlorpyrifos and ethion were present above this level; fungicide residues were not detected. Following pickling, only ethion residues were still present in the onions at levels greater than 0.1 mg/kg. (Author abstract by permission)

81-1313. Van Dijk, H. (Inst. Soil Fertil., Haren-Gr, The Netherlands) **Dissipation rates in soil of 1,2-dichloropropane and 1,3- and 2,3-dichloropropenes.** *Pestic. Sci.* 11(6): 625-632; 1980 (7 references).

The rates of dissipation is soil and chloride-ion release, of the main components of dichloropropane-dichloropropane mixtures used as nematicides, were studied in sealed glass containers at different temperatures and moisture conditions. Half-lives of (*Z*)- and (*E*)-1,3-dichloropropene at 20°C in soils were found to vary from 3 to 25 days; those of 1,2-dichloropropane and 2,3-dichloropropene were about 4 times and twice as long, respectively. The dissipation rates changed by a factor of about 2 per 10°C changes in temperature. Judging from the release rates of water-extractable inorganic chloride in the soil (0-4%/wk), the total degradation of all components applied at normal field rates was extremely slow. This indicated the formation of residues containing covalently bound chlorine. Only in enrichment cultures was complete degradation indicated. (Author abstract by permission)

81-1314. Fishwick, F. B.; Hill, E. G.; Rutter, I.; Warre, P. R. (Pest Control Chem. Dep., Min. Agric. Fish. &

Food, Liverpool L1 8JJ, England) **Gamma-HCH in eggs and poultry arising from exposure to thermal vaporisers.** *Pestic. Sci.* 11(6): 633-642; 1980 (19 references).

Levels of γ-HCH (γ-BHC; lindane) have been determined in poultry tissue and eggs taken from poultry houses in which thermal vaporizers were operated. During continuous operation for 14 mo, residue levels of γ-HCH in both substrates were closely related to changing levels of insecticide in the vaporizer; up to 46 mg/kg (on a fat basis) was found in tissue and up to 4.0 mg/kg (on a whole liquid basis) in eggs. Where the vaporizers were operated discontinuously, maximum levels were 6.7 mg/kg in tissue and 0.53 mg/kg in eggs. (Author abstract by permission)

81-1315. McEwen, F. L.; Ritcey, G.; Braun, H.; Frank, R.; Ripley, B. D. (Dep. Environ. Biol., Univ. Guelph, Guelph, Ontario N1G 2W1, Canada) **Foliar pesticide residues in relation to worker re-entry.** *Pestic. Sci.* 11(6): 643-650; 1980 (17 references).

Residues were determined at 1 hr intervals during the 48 hr after application of endosulfan, leptophos, methamidophos, methomyl and mevinphos to head lettuce; of endosulfan, methamidophos and methomyl to cauliflower; and of parathion to onions and carrots. Residues of phosalone and parathion were measured on apple leaves 0, 1, 2, 4, 8 and 16 days after application. In addition, the portion of the residue on apple leaves that could be dislodged was measured, as well as the residues on gloves used to handle the apple foliage. There were large differences in the rates of disappearance of the insecticide, differences that must be known in determining safe re-entry periods for workers. (Author abstract by permission)

81-1316. Bateman, G. L. (Rothamsted Exp. Stn., Harpenden, Hertshire AL5 2JQ, England) **Uptake and translocation of fungicides in wheat after seed treatment, as measured by disease response to *Fusarium culmorum*.** *Pestic. Sci.* 11(6): 651-659; 1980 (18 references).

The toxicities of 5 systemic fungicides [benomyl, carbendazim, methyl 4-(2-aminophenyl)-3-thioallophanate (NF48), thiabendazole and thiophanate-methyl] and of 2 non-systemic fungicides [guazatine and phenylmercury acetate (PAM)] against *Fusarium culmorum* were compared on agar plates; their performance as seed treatments was measured by inoculating the shoot bases of wheat seedlings with *F. culmorum* in pot experiments. The 2 most effective compounds, benomyl and thiabendazole, and the less effective thiophanate-methyl, were evaluated in further seed treatment experiments in which leaf sheaths and roots of slightly older plants were infected. The 3 fungicides protected the first leaf sheath for more than 5 wk, but thiophanate-methyl was least effective. Against root disease, they were effective when infection was mild, but only thiabendazole significantly controlled severe infection. Bioautography confirmed that fungicide levels in shoots were greater after benomyl and thiabendazole, than after carbendazim and thiophanate-methyl treatment, and that concentrations of fungicide after benomyl, carbendazim and thiophanate-methyl treatments generally declined between 5-13 wk after treatment. Thiabendazole produced a second fungitoxic component detectable in plants after 34 days. (Author abstract by permission)

81-1317. Webley, D. J.; Kilminster, K. M. (Trop. Stored Prod. Cent., Trop. Prod. Inst., Slough, Berks, England) **The persistence of insecticide spray deposits on woven polypropylene and jute sacking.** *Pestic. Sci.* 11(6): 667-673; 1980 (8 references).

A laboratory comparison was made of the persistence of insecticide deposits on woven polypropylene and jute, and the residues found on a thin layer of maize as a result of the treatments. The chemicals used included bromophos, fenitrothion, malathion, pirimiphos-methyl and permethrin. Shallow oven trays were slightly overfilled with clean maize. The surface of the maize was covered with test fabric that had been sprayed with 4.5 ml each of the diluted insecticide solution, usually at an equivalent of 1 g AI/m². Permethrin was exceptionally persistent, particularly on jute, over the entire 12 wk of study. Organophosphorus compounds were less persistent. Residues in grain were inversely correlated with the persistence on the fabric surface. Residues were lowest with permethrin, and greatest with the organophosphorus compounds on polypropylene. Residues after application by emulsifiable concentrate formulations were almost double the residues resulting from wettable powder formulations. Very little spray passed through the fabric at time of application. Subsequent appearance of residues in the crop were closely related to volatility; the most volatile compounds resulted in the highest residues. In the case of jute, the insecticides were firmly locked in the fibers, giving greater persistence and smaller grain residues. The results suggest that only in cases of repeated spraying is there a residue hazard to the health of consumers.

81-1318. Gupta, S. K.; Neena, S.; Patel, J. S.; Chatterjee, S. K.; Kashyap, S. K. (Med. Ind. Toxicol. Div., Natl. Inst. Occup. Health, Ahmedabad-16, India) **Organochlorine insecticide residues in fat of people from urban centres in India. I.** *Pesticides* 14(6): 3, 4, 13; 1980 (7 references).

As part of a countrywide organochlorine insecticide monitoring program, omental fat samples were collected during autopsy from 45 residents of Calcutta, India. Gas-liquid chromatography techniques were used to detect DDT and its metabolites and the various isomers of BHC. The mean level of ΣDDT was 6.25 ppm. The mean level of ΣBHC was 1.60 ppm. *p,p'*-DDE accounted for 66.7% of the ΣDDT. β-BHC accounted for 62.5% of ΣBHC. Males showed higher residue levels than females; residues increased with age.

81-1319. Sharma, H. C.; Agarwal, R. A. (Author address not given) **Environmental pollution due to pesticides industry and methods to reduce it in India. II.** *Pesticides* 14(11): 3-17; 1980 (25 references).

A discussion is presented of the air and water pollution resulting from the pesticide industry in India. Pesticidal sources of air pollution are chimney emissions, evaporation of various volatile products, and dust clouds produced during grinding operations. Some of the pesticides considered include DDT, BHC, maleic hydrazide and fungicides and herbicides. Such air pollution affects plant growth, contributes to soil pollution, and produces acute and chronic effects on human health. Human health effects include increased mortality in heavily polluted areas, possible carcinogenic effects, and respiratory problems (chronic bronchitis, emphysema). The pesticide industry also discharges wastes into the river systems, and the extent of this problem in India is discussed. It is pointed out that the persistent chemicals such as DDT are especially dangerous due to possible bioaccumulation. Measures to curb pollution include monitoring of industrial workers, adoption of safety procedures, and improved disposal of solid wastes.

81-1320. Rajukkannu, K.; Saivaraj, K.; Vasudevan, P.; Balasubramanian, M. (Tamil Nadu Agric. Univ., Coimbatore, India) **Residues of certain newer insecticides in brinjal.** *Pesticides* 14(11): 15-17; 1980 (8 references).

Experiments were carried out to determine the residues of phosalone (0.70 kg AI/ha), quinalphos (0.50 kg AI/ha), fenitrothion (1.00 kg AI/ha), and methyl parathion (0.50 kg AI/ha) on brinjal fruits. Insecticides were sprayed 4 times at 15 day intervals, beginning at the time of flowering. Fruit samples were collected at 1 hr, and at 1, 3, 5, 7 and 10 days after the last spray. Insecticide residues were determined by chemical and bioassay *(Drosophila melanogaster)* methods. At 3 days after application, residues were 1.04, 2.50, 6.48 and 0.96 ppm for phosalone, quinalphos, methyl parathion and fenitrothion, respectively. The half-life values and tolerance limits were calculated. Waiting periods of 7.14 days for methyl parathion, 3.30 days for fenitrothion, 2.94 days for quinalphos, and 1.55 days for phosalone between harvest and consumption were recommended.

81-1321. Galassi, S.; Provini, A. (Ist. Ric. Sulle Acque, CNR, Reparto di Milano, Italy) **Chlorinated pesticides and PCBs contents of the two main tributaries into the Adriatic Sea.** *Sci. Total Environ.* 17(1): 51-57; 1981 (16 references).

From November 1977 to November 1978, samples were collected from the Po and Adige Rivers in Italy at monthly or semi-monthly intervals, and analyzed for chlorinated pesticides and PCBs. A total of 36 samples were collected and analyzed by gas chromatography. Aldrin, heptachlor, heptachlor epoxide, endrin, HCB, (hexachlorobenzene) and *p,p′*-DDE were not detected in any of the samples. Dieldrin was found in only one sample, at a very low level. *p,p′*-DDT was found in several samples (average 1.2 ng/l in the Po and 3.3 ng/l in the Adige). All water samples contained α-BHC (average 10.2 ng/l in the Po and 6.4 ng/l in the Adige), and α-BHC (lindane) (average 5.3 ng/l in the Po and 4.3 ng/l in the Adige). The data were compared with values obtained from 1969-1973. A sharp downward trend in residue levels was observed. The PCB levels reported are higher by one order of magnitude than those reported for the Mediterranean Sea.

81-1322. Uno, M.; Naoi, Y.; Okada, T.; Onji, Y.; Ohmae, T.; Nishikawa, Y. (Nara Prefect. Inst. Public Health, Nara, Japan) **[Residue of ethylene thiourea in commercial food commodities.]** *Shokuhin Eiseigaku Zasshi (J. Food Hyg. Soc. Jpn.)* 21(5): 392-397; 1980 (40 references) (Japanese).

Residues of ethylene thiourea (ETU) and dithiocarbamate fungicides in various crops, processed fruits and fruit and vegetable juices were determined. Recombination assays of ETU and its degradation products with *Bacillus subtilis* were also performed to determine mutagenicity. ETU residues were not observed in most crops or juices, nor in any samples of processed fruits. Residues of 0.1-0.21 ppm were detected in 10 crop samples and residues of ethylene-*bis*-dithiocarbamate (calculated in terms of zineb) ranged from not detected (ND) to 4.8 ppm. No dimethyldithiocarbamate residues were observed in these samples. In only 3 samples of vegetable juice, ETU residues were detected; 0.005-0.01 ppm. In the recombination assays, mutagenicity was observed for furylframide (AF-2), mitomycin C, and *N*-nitroso ETU at levels of 2-20 μg/disk.

81-1323. Woolson, E. A.; Isensee, A. R. (Pestic. Degrad. Lab., SEA, USDA, Beltsville, MD 20705) **Soil residue accumulation from three applied arsenic sources.** *Weed Sci.* 29(1): 17-21; 1981 (12 references).

As a result of applying arsenicals as herbicides, desiccants, or soil sterilants, soil As levels can increase under some conditions. Three arsenicals, sodium arsenite ($NaAsO_2$), cacodylic acid (hydroxydimethylarsine oxide), and MSMA (monosodium methanearsonate), were applied to bare soil at 1, 2 and 10 times the recommended maximum application rates. After incorporation, radishes (*Raphanus sativus* L.) and soybeans [*Glycine max* (L.) Merr.] were planted as indicator crops to assess the phytotoxicity of accumulated soil As residues. Soil As residues increased at all levels of application. However, only 50% of the As applied at 10 times the recommended rate was found after 7 annual applications, regardless of the source. Total losses of As from the soil averaged 14-15% of

that applied each year. At 10 times the recommended rate, As generally reduced radish and soybean yields, but seldom reduced yields at the 2 lower rates. Results indicated little danger of As residue accumulating to phytotoxic levels under normal application rates. (Author abstract by permission)

See also 81-1202, 81-1207, 81-1208, 81-1213, 81-1214, 81-1215, 81-1217, 81-1223, 81-1240, 81-1249, 81-1252, 81-1256, 81-1258, 81-1260, 81-1267, 81-1269, 81-1329, 81-1330, 81-1331, 81-1332, 81-1333, 81-1334, 81-1344, 81-1355, 81-1363, 81-1376, 81-1382, 81-1392, 81-1405, 81-1444, 81-1454, 81-1456, 81-1459, 81-1476, 81-1484, 81-1492, 81-1494, 81-1496 *and* 81-1500.

81-1324. Anonymous **Pentachlorophenol.** *Am. Ind. Hyg. Assoc. J.* 42(1): A-16, A-18; 1981.

A report of the potential health hazards associated with the occupational use of PCP (pentachlorophenol) is presented. Lists of industries possibly affected and precautionary measures to reduce the hazard are given. The health hazard alert is based on reports of human deaths and acute toxicities in humans following ingestion or dermal absorption of PCP. Animal studies indicate PCP is extremely fetotoxic: significant increases in fetal resorptions, alterations in sex ratios of offspring and skeletal anomalies have been observed. Development of chloracne has been associated with worker exposure to PCP. The importance of potential harm during prenatal development is noted to be enhanced due to the increased numbers of women in the work force.

81-1325. Xintaras, C.; Burg, J. R.; Johnson, B. L.; Tanaka, S.; Lee, S. T.; Bender, J. (Div. Surveill. Hazard Eval. & Field Stud., NIOSH, Cincinnati, Ohio 45226) **Neurotoxic effects of exposed chemical workers.** *Ann. NY Acad. Sci.* 329: 30-38; 1979 (8 references).

A recent NIOSH study of pesticide workers exposed to leptophos and other chemicals is reviewed. Potential health problems were noted among employees at the Velsicol Chemical Company's Bayport Plant in Houston, Texas, where leptophos was manufactured and packaged. Twelve cases of serious neurological disorders had been identified in June of 1975, 7 of which were included in the NIOSH study. Of these 7, 5 had a neurological abnormality, 2 failed the psychological test battery, 2 showed abnormal electroneurographic findings, and 1 worker had an abnormal electromyograph. Most of the workers at the plant with symptoms of pesticide poisoning were seen by different physicians, and diagnoses made were of more common problems; pesticide exposure was not considered in most cases. It is suggested that more careful application of health testing for employees, with specific attention to neurological findings, might detect occupational exposure to chemicals at the time of exposure.

81-1326. de Serres, F. J. (NIEHS, Research Triangle Park, NC 27709) **Evaluation of tests for mutagenicity as indicators of environmental mutagens and carcinogens.** *Ann. NY Acad. Sci.* 329: 75-84; 1979 (26 references).

Procedures used to determine and evaluate mutagenicity of environmental contaminants are reviewed. The role of the genetic toxicologist, the types of genetic damage induced, and the significance of each type of damage for humans are briefly outlined. The four phases of evaluating the mutagenic activity of environmental chemicals, detection, verification, determination of the potency and spectrum of genetic alterations produced, extrapolation of laboratory animal data to the human population, and the correlation between carcinogenic and mutagenic activity are discussed. Progress and problems encountered through regulatory approaches for evaluating mutagenic potentials of consumer products are illustrated by the attempts of the US EPA to test and register pesticides.

81-1327. Wilhelm, K.; Bradamante, V. (Inst. Med. Res. & Occup. Health, Zagreb, Yugoslavia) **Blood cholinesterase activity in workers exposed to cholinesterases, a ten-year follow-up.** *Arh. Hig. Rada Toksikol.* 31(2): 109-124; 1980 (28 references).

A case-control study of workers occupationally exposed to a number of anticholinesterase insecticides was carried out with emphasis on the subclinical effects. Cholinesterase (ChE) activities in the blood of workers were assessed and were later correlated to exposure and to the cholinergic signs and symptoms of poisoning. A total of 408 subjects were studied over a 2 yr period. Of these, 170 were continuously employed in the production of pesticides for 2 to 14 yr. Others were seasonal workers. Industrial workers apparently wore adequate protective clothing. Field employees were more significantly exposed, due to lack of recognition of the need for protective clothing. ChE activities were 0.35-2.06 for plasma, and 2.70-7.70 for blood, with means of 1.34 and 5.10, respectively. Some of the chemicals involved were dimethoate, phosalone, dichlorvos, dioxacarb, and carbaryl. It was determined that biweekly measurements of ChE activity during periods of intense production were the only practical method of determining degrees of absorption. In workers demonstrating cholinergic symptoms, blood ChE activity was inhibited 50% or more. However, worker complaints were not always related to ChE inhibition. Long-term exposure to anticholinesterase apparently had no effect on peripheral blood as revealed by blood cell counts.

81-1328. Barreto, J. (Sch. Law, Golden Gate Univ., San Francisco, CA) **Women farm workers in California.** *Golden State Univ. Law Rev.* 10(3): 1117-1146; 1980 (182 references).

The problems faced by women farm workers in the home and in the fields are discussed. The demography of, and special areas of concern to, women farm workers are explored. Pesticide regulation is discussed in terms of the effect of pesticides on health and the effects of inefficient regulation on farm workers. Pesticides may be adsorbed through the skin, or through inhalation during regular use. Farm workers are exposed during application, and when they work in fields to which these chemicals have been applied. The effects of physical impairment induced by pesticide poisoning on the lives of women farm workers is considered. Chlorinated hydrocarbon pesticides have been linked to ovarian menstrual dysfunctions and childbearing disorders, including spontaneous abortion, eclampsia, still birth, birth defects, and premature rupture of the amniotic

sac. Mutation, sterilization and death have also been observed. Organophosphorus compounds suppress cholinesterase levels in the blood. Problems with enforcing pesticide regulations to protect the health of the farm workers are reviewed.

81-1329. Lue-Hing, C.; Lordi, D. T.; Whitebloom, S.; Richardson, G. (Res. & Dev., Metrop. Sanit. Dist. Greater Chicago, Chicago, IL) **Explosion at a pesticide manufacturing plant.** *Ind. Wastes (Chicago)* 27(1): 12-13, 34; 1981 (2 references).

The emergency control measures carried out after an explosion at a pesticide manufacturing plant are described. The damaged area of the plant was involved in the manufacture of o-ethyl-o-p-nitrophenyl phenylphosphorothioate (EPN). Unknown quantities of EPN were flushed (due to fire fighting activities) into a drainage ditch, and subsequently into the sanitary sewer system of the pesticide plant and into a waste treatment plant. It was decided that the EPN would be detoxified through alkaline hydrolysis by the addition of sodium hydroxide. At the water treatment plant, the initial EPN level of 5.8 mg/l was reduced to zero following treatment with sodium hydroxide and about 2 wk of aeration. In order to detoxify the EPN in the drainage ditch, sodium hydroxide was applied at various locations until the pH of the contents was raised to about 11.0. After treatment, the affected water was pumped into an abandoned gypsum lagoon system. It was noted that personnel operating the pumps at the explosion site were told to shower using large quantities of soap, and their clothing was confiscated by the company.

81-1330. Thakkar, N.; Muthal, P. L. (Natl. Environ. Eng. Res. Inst., Nagpur 440020, India) **Granular activated carbon in pesticides removal.** *Indian J. Environ. Health* 22(2): 124-129; 1980 (10 references).

The filtration adsorption technique was evaluated for removing pesticides from water samples using granular activated carbon (GAC). γ-BHC (lindane), aldrin, dieldrin, and *p,p'*-DDT were added to water samples to produce contamination at various ppb and ppm levels. Contaminated waters were passed through 50 cm GAC columns at 0.9, 1.26, 1.98, and 2.28 *M*/hr and 1 *l* samples were collected. Pesticides were extracted from the water samples with ethyl ether + hexane, concentrated to 1 ml and analyzed by gas chromatography. As flow rates increased, the efficiency of pesticide removal decreased. The average removal of pesticides at 0.9 *M*/hr volumetric loading was comparatively greater than at 1.26 *M*/hr. At loads of 0.3-5.0 ppm and a rate of 0.90 *M*/hr, removal was 93% for aldrin, 97% for *p,p'*-DDT, 98% for dieldrin and 99% for lindane. At loads of 0.01-0.05 ppm and a rate of 2.28 *M*/hr, removal was 88%, 80%, 96% and 88% for aldrin, *p,p'*-DDT, dieldrin and lindane, respectively. It was concluded that under specified operating conditions granular activated carbon columns remove pesticides from water efficiently.

81-1331. Schaller, K. H.; Manke, G.; Raithel, H. J.; Buhlmeyer, G.; Schmidt, M.; Valentin, H. (Inst. Arbeits. & Socialmed., Univ. Erlangen-Nurnberg, D-8520 Erlangen, BRD) **Investigations of thallium-exposed workers in cement factories.** *Int. Arch. Occup. Environ. Health* 47(3): 223-231; 1980 (24 references).

Case histories are discussed of cement factory workers exposed to thallium. A total of 128 cement factory workers from 3 different factories, who were exposed to thallium, were studied. Urine samples were analyzed by atomic absorption. Physical examinations were carried out on all subjects. None of the exposed workers exhibited symptoms of thallium poisoning. The urine analyses indicated a range of < 0.3 to 6.3 μg thallium/g creatinine. The normal upper limit of thallium excretion was calculated as 1.1 μg/g creatinine. At factory A, 72% of the values were within the normal range; at factory B, 33% were within the normal range; and at factory C, 71% were within the normal range.

81-1332. Su, G.; Wurzel, K. A. (Michigan Dep. Nat. Resour., Lansing, MI) **A regulatory framework for setting air emission limits for noncriteria pollutants.** *J. Air Pollut. Control Assoc.* 31(2): 160-162; 1981 (5 references).

A comprehensive regulatory framework is presented for the control of air emissions of noncriteria pollutants. The system contains built-in flexibility to minimize common deficiencies such as regulatory overkill, inadequate regulation, extensive bureaucratic red tape and non-uniformity. The framework consists of 3 parts; a toxicity model, a dispersion model, and a panel of experts. The toxicity model combines toxicity data and a safety factor to determine an acceptable ambient concentration. Sample calculations, using LD50, LC50, and short- and long-term no observable effect level data, are presented in tabular form for various compounds, including acetaldehyde, hexachlorobutadiene, methylene chloride, ethylene oxide, DDT, methoxychlor, sodium arsenite and thiourea. The dispersion model is used to calculate emission limits according to stack parameters and distance to property lines. A panel of technical experts is recommended for a case-by-case evaluation of problems relating to carcinogens and mutagens, circumstances unanticipated by the model, or complex, conflicting data. Special consideration is given to batch, intermittent, or short-term experimental processes. It is concluded that this system imposes uniformity, objectivity and predictability on the regulatory agency, and that this framework should provide reasonable protection of the public health and protection of the environment.

81-1333. Butler, L. C.; Staiff, D. C.; Sovocool, G. W.; Davis, J. E. (Wenatchee Pestic. Res. Branch, Environ. Toxicol. Div., US EPA, Wenatchee, WA 98801) **Field disposal of methyl parathion using acidified powdered zinc.** *J. Environ. Sci. Health B* 16(1): 49-58; 1981 (7 references).

The reduction of methyl parathion with acid and zinc was explored to determine whether this would accelerate degradation of methyl parathion to its less toxic *p*-aminophenyl derivative and/or produce less toxic breakdown products. Methyl parathion disappearance was followed for 2.5 yr. The acidified powdered zinc treatment at burial proved effective in degrading methyl parathion. The treatment was more effective with increasing amounts of zinc. The greatest degradation was noted with the highest amounts of zinc 2.5 yr after burial. Analysis by gas chromatography/mass spectrometry of extracts from the 30.0 nmol acidified zinc reduction confirmed the presence of aminomethyl parathion. At least 4 additional products were formed, either by aminomethylation or azo or azoxy coupling. Before this method of methyl parathion degradation can be considered suitable, the toxicities of these additional products must be determined.

81-1334. Schuuring, C. (Author address not given) **Dutch dumps.** *Nature (London)* 289(5796): 340; 1981.

A description of some of the problems of chemical waste dumps in The Netherlands is presented. It is pointed out that 3000 such dumps have been found and 500 are recognized as public health dangers. Cases of cattle infertility and bird deaths led to an investigation that indicated a marshy area of Amsterdam contained about 10,000 drums of waste from a 2,4,5-T factory. The drums contained chlorobenzene, chlorophenol, and 2,4,5-T (which was possibly contaminated with 2,3,7,8-TCDD). The waste chemicals were found at levels of tenths to hundredths of mg/kg in soil, water, livestock, and garden produce from the area. In another incident, small amounts of methyl bromide were detected in drinking water from an agricultural area. The chemical had apparently seeped through the PVC pipes used for private water distribution. The Netherlands is carrying out a national inventory of chemical wastes in order to control these problems.

81-1335. Iwata, K. (Dep. Ophthalmol., Sch. Med., Niigata Univ., Niigata, Asahimachi 1, Japan) **Neuroophthalmologic indices of Minamata disease in Niigata.** In: *Neurotoxicity of the Visual System*. Merigan, W. H., and Weiss, B., eds. (Raven Press: New York, NY): pp. 165-185; 1980 (16 references).

The major neuro-ophthalmological conditions of Minamata disease are described, along with a follow-up study of Minamata disease in Niigata, Japan. Minamata disease refers to the accidental methylmercury poisoning of many residents of the Minamata area of Kumamoto in 1953-1960, due to the ingestion of fish contaminated with methylmercury compounds discharged from an acetaldehyde plant. Another mass methylmercury poisoning occurred in the Niigata area, and 325 patients with high mercury levels and fundamental clinical signs were given a battery of visual tests. Visual acuity was impaired in 105 of the patients, and 120 showed various degrees of constriction of the visual field. Effects were also seen in the critical flicker frequency (CFF) and in the visually evoked cortical responses (VER), including photopic VER, scotopic VER, and peripheral scotopic VER.

81-1336. Ishikawa, S.; Miyata, M. (Div. Environ. Toxicol., Dep. Ophthalmol., Sch. Med., Kitasato Univ., Kanagawa, Japan) **Development of myopia following chronic organophosphate pesticide intoxication: an epidemiological and experimental study.** In: *Neurotoxicity of the Visual System*. Merigan, W. H., and Weiss, B., eds. (Raven Press: New York, NY): pp. 233-254; 1980 (17 references).

An epidemiological study was carried out in school children of the Tokushima and Saku districts in Japan in an attempt to determine a possible relationship between a high level of myopia and the use of organophosphate insecticides. Eye tests were carried out in about 40,000 school children. Total amounts of organophosphates, carbamates and organochlorines, used were calculated from the amounts sold. The incidence of myopia has tended to increase since 1967. This increase has 3 distinct peaks, which coincide with 3 peaks in the amount of organophosphorus pesticides sold. No significant correlation was found between the amount of carbamates or organochlorine pesticides and myopia incidence. Examination of patients with a particular optico-autonomic-peripheral neuropathy (Saku disease) showed a high correlation between myopia with astigmatism and blood level of organophosphate compounds. An experimental study using beagle dogs was also performed. Ethylthiometron was administered daily for 2 yr or fenitrothion was administered 2 times/wk for 1 yr. Various ophthalmologic measurements were made monthly, and at the end of the experimental period, the dogs were sacrificed and tissues were examined histologically. All dogs in the ethylthiometron and fenitrothion groups developed myopia, and electron microscopy indicated this to be secondary to changes within the ciliary muscle.

81-1337. Agnihotri, N. P.; Awasthi, M. D.; Jain, H. K. (Div. Agric. Chem., Indian Agric. Res. Inst., New Delhi, India) **Residue evaluation of different plant and grain protection schedules.** *Pesticides* 14(5): 3-11; 1980 (41 references).

Suggested plant protection schedules that resulted in minimum hazards from toxic residues are presented in tabular form. Crop categories considered were cereals, oil seed crops, pulse crops, cash crops, stored gains and

vegetables. Residues at harvest were evaluated for insecticides applied at recommended times and dosages against target pests for individual crop within each category. Recommendations of safe, unsafe or doubtful were given for each treatment regimen evaluated. Carbaryl, BHC, endrin, phorate, disulfoton, aldrin, endosulfan, tetrachlorvinphos, dicrotophos, trichlorfon, carbofenthion, heptachlor, malathion, DDT, lindane and parathion were judged to present unsafe residue levels at harvest in some crops. Most treatment regimens were found to give nondetectable (ND) or below the tolerance limit residues.

81-1338. Anonymous **Introduction.** *Pollut. Technol. Rev.* 59: 1-22; 1979 (25 references).

Legislative background related to spills and the efforts by the federal government to solve these problems are reviewed. Acts which have effects on the problems of pesticide contamination include the Toxic Substances Control Act of 1976, Clean Water Act of 1977, as well as various EPA regulations. The National Contingency Plan is also reviewed with respect to its history, its basis, its functions and how its provisions relate specifically to spills of hazardous substances. The plan contains general information on discovery and notification of spills, containment and counter-measures to be taken, cleanup and disposal or hazardous materials, restoration of the environmental to pre-spill conditions, and recovery of damages and enforcement of the regulations.

81-1339. Anonymous **Procedures leading to cleanup.** *Pollut. Technol. Rev.* 59: 23-86; 1979 (10 references).

Procedures leading to the cleanup of hazardous spills include notification of a spill, identification and assessment of the situation, classification systems concerning chemicals that vaporize, float, sink, or dissolve, and response techniques for each of these classifications. The National Agricultural Chemicals Association operates a national pesticide information and response network whose function is to provide advice and on-site assistance when spill situations warrant such an approach. Access to the system is through CHEMTREC. On receiving notice of an emergency involving a pesticide spill, the manufacturer is contacted by CHEMTREC. The manufacturer will then provide specific advice concerning how the spill should be best handled. Spill response teams are available on a geographical basis to assist at the scene of the emergency should this be deemed necessary. Hazardous chemical by category; ameliorating agents for use in reducing their hazards; and responses other than dredging are presented in tabular form as aids in determining appropriate response techniques. Activated carbon is recommended for ethylene oxide, aldrin, BHC, carbaryl, *p*-dichlorobenzene, 2,4-dichlorophenol, dichloropropane, DDT, 2,4-dinitroaniline, 2,4-dinitrophenol, PCP, PCBs, toxaphene, trichlorophenol, epichlorohydrin, ethylene dibromide, ethylene dichloride, methyl parathion, hydrazine and copper sulfate. Polyolefin or polyisobutylene fibers, or Amberlite XAD resin, were recommended for aldrin, *p*-dichlorobenzene, DDT, PCP, PCBs, toxaphene and trichlorophenol. Amberlite IRA 400 resin was recommended for hydrazine and copper sulfate.

81-1340. Anonymous **Mechanical cleanup methods.** *Pollut. Technol. Rev.* 59: 87-184; 1979 (44 references).

Mechanical methods used to clean up spills of hazardous materials are discussed. Dispersion and dilution, containment, flotation, dredging, burial, barriers, dikes and trenches are described in detail. Other physical methods reviewed include solvent extraction and the use of aerosols. Dispersion should not be considered as a first choice response for any hazardous chemical spill. Dispersion of the chemical by mechanical means is performed to reduce the concentration of the material to below recommended limits within a short distance of the spill site. Toxaphene, 2,4-dichlorophenol, epichlorohydrin, and furfural have been subjected to dispersion in selected cleanup attempts.

81-1341. Anonymous **Chemical methods.** *Pollut. Technol. Rev.* 59: 185-234; 1979 (78 references).

Chemical methods for controlling hazardous materials spills include neutralization, precipitation, chelation, and redox methods such as oxidation, chlorination, and biodegradation. Portable treatment equipment sources are noted. When attempting to neutralize a chemical spill in water, the pH range of the natural water must be taken into consideration as well as water quality standards concerning pH, limits for aquatic life, and the required reduction of contamination. Various method of applying neutralizing agents are discussed. When using precipitation as a method of cleanup, the requirement for sedimentation as a pretreatment step is determined by the nature of the spill situation. Factors to consider in choosing a precipitant are discussed. Hazardous chemicals amenable to *in situ* oxidation include 2,4-dinitroaniline, 2,4-dinitrophenol, phenol, trichlorophenol, cresols, phthalic anhydride and diphenylmethane diisocyanate. The oxidizing agent must be brought into molecular contact with the hazardous substance. Biodegradation is not considered to have high potential as a spill ameliorating technique. For biodegradation to be effective, large quantities of active acclimated cultures would have to be available. Aldrin and DDT were screened in tests on the efficacy of biodegradation. The kinetics of these reactions indicate biodegradation is unlikely to be useful against persistent pesticides.

81-1342. Anonymous **Sorbents, gels, and foams.** *Pollut. Technol. Rev.* 59: 235-330; 1979 (42 references).

Sorbents most helpful in treating hazardous spills include activated carbon, polyurethane foam, macroreticular resins, propylene fibers, zeolite molecular sieves, sorbent clays, polyolefins, polyethylenes, polyisobutylenes, poly(methyl methacrylates), poly(styrene sulfonates) and ion exchangers. The choice of sorbent depends upon the physical and chemical attraction expected to occur, the surface geometry or morphology, the surface area contaminated, the contact time allowed, and the density ratio of sorbent to sorbate. Activated carbon can be extremely useful in treating contaminated streams, provided that the carbon can be removed or will not injure the environment. Activated carbon can be used in a bouyant, floating state or sunk in porous filter bags suspended from floats to capture sinking contaminants. Magnetized activated carbon is being used to sorb Kepone (chlordecone) from the James River. DDT, toxaphene and other sinking chemicals are effectively removed by sunken activated carbon filters. Physical sorption at the interface of the two phases in floating physical sorbents was demonstrated with epichlorohydrin, diazinon, and malathion.

81-1343. Anonymous **Mobile units.** *Pollut. Technol. Rev.* 59: 331-403; 1979 (19 references).

The purpose of mobile units is to collect and temporarily store diked or pooled spills of hazardous fluids until appropriate removal equipment can be brought to the spill site. Practical methods for removing and processing hazardous or semi-hazardous materials from the bottoms of bodies of water include the use of dredges, collection bags, continuous dynamic reactors, in-place soil detoxification units, and on-site removal and treatment of spilled hazardous materials in aqueous solutions. Mobile dispensing systems for multi-purpose gelling agents and for activated carbon regeneration are also described. Collection bags of reinforced polyvinyl chloride (PVC) are useful for removing hazardous chemicals, including those in the aldrin/toxaphene group, from spill sites. A mobile unit for detoxification and decontamination of water soluble organics spilled in water includes the use of activated carbon and reverse osmosis. Activated carbon effectively removes 2,4-D, 2,4,5-T, silvex, DDT, heptachlor, dieldrin, endrin, lindane and parathion. However, if other organic compounds are present at the spill site, competition for activated carbon may prevent complete adsorption of hazardous pesticides. Adequate contact time can alleviate most of this problem. Chlorinated hydrocarbon pesticides and mercuric chloride could not be suitably eliminated by reverse osmosis.

81-1344. Thebault, P.; Cases, J. M.; Fiessinger, F. (Cent. Rech., Valorisation Minerais, Nancy, France) **Mechanism underlying the removal of organic micropollutants during flocculation by an aluminum or iron salt.** *Water Res.* 15(2): 183-189; 1981 (19 references).

Previous studies in the literature have reported the use of aluminum sulfate coagulation for the removal of BHC, dieldrin, DDT, endrin, parathion, 2,4,5-T, malathion, 2,4-D, linuron, and dibutyl-, diethyl-, and dioctylphtalate and other micropollutants during water treatment processes. The present investigation examines the mechanism of removal of harmful organics by basic aluminum polychloride and ferric chloride coagulation in laboratory tests. Water samples taken from the western Paris distribution system which were free of mineral colloids were spiked with known amounts of lindane, benzopyrene, diethylphtalate and dibutylphtalate. Coagulation-flocculation procedures were carried out using an FLH6 Hydrocure flocculator. In general, the reduction of the micropollutants was poor, except for benzopyrene, which was reduced by 62% on both of the mineral coagulants. The adsorption isotherms for lindane and benzopyrene were found to obey Henry's law. For the diethyl- and dibutylphtalates, the adsorption was attributed to a first order phase change in the adsorbed layer due to the influence of lateral bonds. The efficiency of the removal should be improved by controlling the formation of Al or Fe coagulant species which would favor adsorption.

See also 81-1202, 81-1203, 81-1213, 81-1215, 81-1223, 81-1224, 81-1244, 81-1247, 81-1248, 81-1254, 81-1261, 81-1276, 81-1287, 81-1308, 81-1315, 81-1317, 81-1319, 81-1352, 81-1370, 81-1388, 81-1389, 81-1396, 81-1405 *and* 81-1436.

81-1345. Andreas, K.; Fischer, H. D. (Inst. Pharmakol. & Toxikol., Med. Akad. Carl Gustav Carus, DDR-8010 Dresden, DDR) **Toxizitaet von ORganophosphaten unter dem Einfluss von Neuroleptika. [Toxicity of organophosphates under the effect of neuroleptic drugs.]** *Acta Biol. Med. Ger.* 39(8-9): 987-989; 1980 (German).

The effect of pretreatment with haloperidol and apomorphine on the 1 hr ip LD50 of dichlorvos was studied in male albino AB mice. In one experimental series, the animals were treated with dichlorvos 1 hr after ip or sc administration of haloperidol (2 mg/kg) or of apomorphine (10 mg/kg). In another series, the LD50 of dichlorvos was determined 72 hr after a 7-11 day treatment with haloperidol (2 mg/kg/day ip or sc) or apomorphine (10 mg/kg/day, sc). The LD50 was determined after pretreatment with 0.9% saline solution in the control animals. The LD50 of dichlorvos was found to be 44 mg/kg in the controls, 56 mg/kg after a single ip pretreatment with haloperidol ($p = 0.05$), 58 mg/kg after a single sc pretreatment with haloperidol ($p = 0.05$) and after sc pretreatment with apomorphine ($p = 0.05$), 56 mg/kg after a 7-day pretreatment with haloperidol ip ($p = 0.05$), 58 mg/kg after 7-day sc pretreatment with haloperidol ($p = 0.05$), 59 mg/kg after 10-day sc pretreatment with haloperidol ($p = 0.05$), and 52 mg/kg after 11-day sc pretreatment with apomorphine. The findings suggest the direct action of haloperidol and apomorphine on cholinesterase activity, without dopaminergic systemic effect.

81-1346. Halliop, J.; Tochman, A.; Latalski, M. (Indep. Electron Microsc. Lab., Inst. Biol. Morphol., Acad. Med., PL-20007 Lublin, Poland) **Badania ultrastrukturalne oraz badania mieloperoksydazy granulocytow obojetnochlonnych szczura w ostrym zatruciu kwasem 2,4-dwuchlorofenoksyoctowym. [Ultrastructural investigations and myeloperoxidase determinations in rat neutrophils in acute poisoning with 2,4-dichlorophenoxyacetic acid.]** *Acta Haematol. Pol.* 11(4): 249-257; 1980 (17 references) (Polish).

Observation was made of the ultrastructural changes and activity of myeloperoxidase of different developing forms of cells in bone marrow neutrophils of rats acutely poisoned with 2,3-dichlorophenoxyacetic acid (2,4-D). Disturbances of granulogenesis were observed in some cells of rats to which 160 mg 2,4-D/kg body wt was administered, and in most cells when dosage was 400 mg/kg. Decrease in the number of primary and secondary granules in different developing forms of the neutrophils, accompanied by numerous cytoplasmic vacuoles, was observed. Disturbances in metabolism due to acute poisoning with the herbicide 2,4-D can lead to formation of cells with changes enzymatic composition. The results indicate that in acute 2,4-D toxicity primary granules participate in phagocytosis.

81-1347. Grahl, K.; Stelzer, W.; Stottmeister, S. (Forschungsinst. Hyg. & Mikrobiol., DDR-9933 Bad Elster, DDR) **The toxicity of butonate, trichlorfon and dichlorvos against *Escherichia coli* and *Enterobacter aerogenes*.** *Acta Hydrochim. Hydrobiol.* 8(1): 19-28; 1980 (57 references).

The toxicity of butonate, trichlorfon and dichlorvos to *Escherichia coli* and *Enterobacter aerogenes* was studied in glucose-mineral acid cultures at 30°C. Growth rates were determined from the oxygen consumption of the cultures in SAPROMAT AP 12. Butonate and trichlorfon decreased the growth rate of *E. coli* and *E. aerogenes* at concentrations > 1000 mg/l. Dichlorvos decreased growth rates at concentrations ≥ 250 mg/l. At lower concentrations the pesticides were inactivated and metabolized by the bacteria.

81-1348. Ulaszewski, S.; Kolodynski, J.; Fekri, A.; Witek, S. (Dep. Genet., Microbiol. Inst., Univ. Wroclaw, P-51148 Wroclaw, Poland) **The lethal effects of some olopn Ehosphate (*sic*) insecticides on yeast *Saccharomyces cerevisiae*.** *Acta Microbiol. Pol.* 29(3): 293-307; 1980 (24 references).

Studies were performed on yeast to determine the toxicity of some enolophosphate insecticides. Yeast cultures were exposed to the insecticides, after which cell viability was determined, cell fermentation was measured, and transport of amino acids and sugar uptake activity were analyzed. Chlorfenvinphos, bromfenvinphos, and mebromvinphos inhibited amino acid transport, respiration, fermentation, cell growth, sugar transport activity, and cell viability. Cell death followed, resulting from increased diffusion of ions through the cell membranes. Mebromvinphos was the most toxic insecticide tested. The toxicities of chlorfenvinphos and bromfenvinphos were equal.

81-1349. Brumback, R. A. (Sch. Med., Univ. North Dakota, Fargo, ND) **The neuromuscular junction. Part I: physiology and the effects of drugs and toxins.** *Am. Fam. Physician* 23(1): 188-192; 1981 (7 references).

The physiology of the neuromuscular junction is described. The action of muscle relaxants and organophosphorus poisoning are explained. When the nerve terminal is depolarized, synaptic vesicles containing acetylcholine are released. When these contact receptors in the muscle end-plate, membrane permeability of sodium and potassium is changed, resulting in muscle depolarization. The insecticides parathion and malathion can produce muscle weakness by irreversibly inactivating acetylcholinesterase. Acetylcholine can no longer be rapidly hydrolyzed in the synaptic clefts, and accumulates at the end-plate. Membrane repolarization cannot occur, and the postsynaptic membranes are in a nearly continuous state of increased permeability and electrical depolarization. It is noted that

oxime compounds will reactivate organophosphorus-inactivated acetylcholinesterase.

81-1350. Reiser, K. M.; Last, J. A.* (California Primate Res. Cent., Univ. California, Davis, CA 95616) **Pulmonary fibrosis in experimental acute respiratory disease.** *Am. Rev. Respir. Dis.* 123(1): 58-63; 1981 (36 references).

Primary fibrosis in rats with induced respiratory disorders was examined. Three groups of rats were each exposed to a fibrogenic stimuli, and collagen metabolism was examined. One group was given a single ip injection of 24 mg paraquat/kg body wt, 6 days prior of analysis of the lung tissue. Another group was exposed to 3.0 mg/m³ of ozone for 6 days. The third group received 1.5 units of bleomycin by intratracheal administration. A fourth group served as a control. Collagen synthesis was determined by [³H]proline (Hpr) uptake. Synthesis was significantly increased by all 3 pneumotoxins. Paraquat, ozone and bleomycin resulted in 248, 92, and 70 nmol Hpr/(g protein)/hr, respectively. Control values were 28 nmol/(g protein)/hr. The studies indicate an increase in type I collagen was the primary result of induced fibrosis.

81-1351. Block, E. R.; Schoen, F. J. (Dep. Med., Coll. Med., Univ. Florida, Gainesville, FL 32610) **Effect of alpha naphthylthiourea on uptake of 5-hydroxytryptamine from the pulmonary circulation.** *Am. Rev. Respir. Dis.* 123(1): 69-73; 1981 (25 references).

Studies were performed on rat lungs to determine the effect of the rodenticide alpha naphthylthiourea (ANTU) on the uptake of 5-hydroxytryptamine (5-HT). The animals were injected ip with either 5 or 10 mg/kg ANTU, the lungs were excised at various intervals, and the uptake of [¹⁴C]5-HT was determined. Lung tissues were subsequently examined histologically by light microscopy. The 5-HT uptake rate was reduced in treated rats after 4 hr. At 24 hr after treatment, lung edema was noted by histological examination, and 5-HT was further reduced, especially in the 10 mg/kg group. At 2 wk after treatment, the levels of uptake in the treated groups were equal to those in the control group. Although these tests were limited to the study of the effects of ANTU, it is believed that these tests can be of great value in detecting and evaluating pulmonary endothelial cell injury resulting from other toxic substances.

81-1352. Stephens, D. S.; Walker, D. H.; Schaffner, W.; Kaplowitz, L. G.; Brashear, H. R.; Roberts, R.; Spickard, W. A., Jr. (Div. Infect. Dis. Dep. Med., Sch. Med., Vanderbilt Univ., Nashville, TN) **Pseudodiphtheria: prominent pharyngeal membrane associated with fatal paraquat ingestion.** *Ann. Int. Med.* 94(2): 202-204; 1981 (19 references).

Case reports of 3 patients who ingested fatal doses of the herbicide paraquat are presented. Each patient presented with prominent pharyngeal membranes. A preliminary diagnosis of tonsiller-pharyngeal diphtheria was made; treatment for diphtheria was begun in each case. Paraquat ingestion was discovered later. The importance of prompt diagnosis of paraquat poisoning is suggested. Paraquat poisoning can be differentiated from diphtheria by the extent of the oral membrane involvement. In these cases the tongue was heavily involved; typical diphtheria membrane rarely involves the gums, floor of the mouth, or the tongue.

81-1353. Picciano, D. (Off. Carcinog. Identif. Classif., OSHA, US Dep. Labor, Washington, DC 20210) **Faulty experimental design and underutilization of cytogenetic data: benzene and epichlorohydrin.** *Ann. NY Acad. Sci.* 329: 321-327; 1979 (16 references).

The possible use of human cytogenic monitoring procedures are discussed, with emphasis on some problems that may occur due to faulty experimental design or underutilization of data. The faulty selection of research projects or of test compounds may lead to collection of unnecessary data. Faulty selection of test systems can also yield data of little value, as can improper selection of controls, sample size, and methods of data collection and analysis. Useful information may also be obtained, but the results may not be utilized. Problems include the re-evaluation of data until the expected results are obtained, excessive time spent on review for publication, and unnecessary repetition of investigations. An example of the latter, a cytogenetic study on epichlorohydrin-exposed workers and 75 unexposed individuals, is discussed. Analysis for cytogenetic damage was carried out on 200 metaphase cells/individual. Statistically significant differences ($p < 0.005$) in the distribution of individuals with chromatid breaks, chromosome breaks, severely damaged cells, and total abnormal cells, were found. Cytogenetic studies were repeated in 17 workers with high levels of damage 5 mo after the initial study and concomitant cleanup of the plant. A reduction in frequency of aberrations was found. However, a statistically significant difference ($p < 0.05$) between these workers and 18 nonexposed individuals also existed. It was proposed that a third study be conducted before definite conclusions about the mutagenicity of epichlorohydrin were made.

81-1354. Peterson, E.; Fairshter, R.; Morrison, J.; Cesario, T. (Univ. California, Irvine, CA 92668) **Effects of the herbicide paraquat dichloride on bacteria of human origin.** *Appl. Environ. Microbiol.* 41(1): 327-328; 1981 (7 references).

The effects of the herbicide paraquat on bacteria of human origin was studied. Seventy-two bacterial isolates from clinical specimens (strains from 6 different bacterial genera) were used. Ten-fold serial dilutions of paraquat

(10^{-2} to 10^{-7} *M*) were prepared; 1 ml of each paraquat dilution was incubated with 1 ml of bacterial suspension. The minimum inhibitory concentration (MIC) was considered to be the last dilution of paraquat to inhibit visible growth. The minimum bactericidal concentration (MBC) was considered to be the last dilution toxic to > 99.9% of the original inoculum. The majority of the gram-negative rods (43 of 48) were inhibited by 10^{-3} *M* (256 μg/ml) paraquat. The gram-positive organisms were more resistant. *Streptococcus faecalis* were not inhibited by any of the concentrations tested. It was shown that the MICs for *Escherichia coli* and *Klebsiella pneumoniae* were lower in aerobic as opposed to anaerobic environments, suggesting that paraquat toxicity is at least partially mediated by the product of cyclic oxidation-reduction involving cellular components, paraquat and oxygen. It was concluded that the MICs and MBCs of paraquat for bacteria of human origin are above levels likely to be encountered in the environment.

81-1355. Lennox, L. B.; Alexander, M. (Buffalo State Coll., Buffalo, NY 14222) **Fungicide enhancement of nitrogen fixation and colonization of *Phaseolus vulgaris* by *Rhizobium phaseoli*.** *Appl. Environ. Microbiol.* 41(2): 404-411; 1981 (22 references).

The number and weight of pods and the weight and nitrogen content of the tops of beans *(Phaseolus vulgaris)* derived from seeds inoculated with a thiram-resistant strain of *Rhizobium phaseoli* were increased if the seeds were treated with thiram before sowing in soil. A greater percentage of the nodules on 21-day-old plants were derived from the resistant strain, more nodules were formed, and these nodules were more effective in the presence of the fungicide than in its absence. These differences in nodule numbers were no longer present in 56-day-old plants, and only a small percentage of the nodules contained the resistant strain. The abundance of the fungicide-tolerant *R. phaseoli* increased rapidly soon after planting the seed and subsequently fell markedly, but the rate of decline was less if the seeds had been treated with the chemical. Protozoa also proliferated if thiram had not been applied to the seed, but their numbers were deleteriously influenced by thiram. *Bdellovibrio*, bacteriophages, and lytic microorganisms acting on *R. phaseoli* were rare under these conditions. Ciliates and flagellated protozoa were initially suppressed by planting thiram-coated bean seeds in nonsterile soil, but the former were inhibited longer than the latter and the ciliate numbers never fully recovered if the seeds were treated with the fungicide. The resistant strain grew well in sterile soil also inoculated with a protozoa-free mixture of soil microorganisms whether thiram was added or not, but after an initial rise in numbers its abundance fell if the mixture contained protozoa; the rate of this fall was delayed by the fungicide. The numbers of *R. phaseoli* were consistently less in sterile soil inoculated with the rhizobium plus a mixture of soil microorganisms containing ciliates and other protozoa than if the inoculum contained other protozoa but no ciliates. These results suggest that a suppression of protozoa, and possibly especially the ciliates, accounts for the enhanced growth of beans and the greater initial frequency of nodules formed by the thiram-resistant *R. phaseoli* in the presence of this fungicide. Thiram applied to uninoculated seed enhanced bean growth if thiram-resistant *R. phaseoli* were present in soil. (Author abstract by permission)

81-1356. McKenzie, J. A.; Dearn, J. M.; Whitten, M. J. (Dep. Genet., Univ. Melbourne, Parkville, Victoria 3052, Australia) **Genetic basis of resistance to diazinon in Victorian populations of the Australian sheep blowfly, *Lucilia cuprina*.** *Aust. J. Biol. Sci.* 33(1): 85-96; 1980 (2[1] references).

Topical application of 0.5 μl of diazinon solutions were made to the dorsal surface of the thorax of the sheep blowfly, *Lucilia cuprina*. Deodorized kerosene was used as the solvent. A uniform distribution of resistant phenotypes was noted for populations of *L. cuprina* from different areas of Victoria, in spite of differences in insecticide usage and sheep management practices between the areas. Genetic mapping studies, allelism tests with R_{1A} and toxicological data all indicate that the resistance allele in Victoria is similar to, if not identical with, the R_{1A}. Pure-breeding resistant strains were derived from each testing area and used as base populations for a selection program on adults. An approximate doubling of the level of resistance was achieved in each strain after 8 generations. Relaxation of selection over 7 generations showed that a stable plateau had been generated in all but the Torrita selected strain.

81-1357. Robin, E. D. (Dep. Med. Physiol., Stanford Univ. Sch. Med., Stanford, CA) **Basic aspects of pulmonary dysfunction as related to hemotherapy.** *Bibl. Haematol. (Pavia)* 46: 210-219; 1980 (15 references).

Exposure to paraquat may cause alterations in pulmonary capillary endothelial-alveolar epithelial permeability. The mechanisms involved in shock lung are of major interest, but the precise pathogenetic mechanisms are not clearly defined. A variety of interacting abnormalities are involved to different degrees in each patient. The possibility that shock lung is a result of hemodynamic abnormalities is explored from 2 perspectives. One suggests that shock lung results from increased pulmonary capillary pressure. The second approach suggests shock lung arises from diffuse microembolization of the lung. The humoral theory of shock lung suggests that circulating humoral factors are elaborated in extrapulmonary sites as a result of shock, and these circulate to the lung, injuring the pulmonary capillary directly. Another theory focuses on injury produced by cells within the lung. A number of cells either indigenous or attracted to the lung could release intracellular factors such as

lysosomal hydrolases, causing endothelial injury. Much attention is focused on free radicals of oxygen or on hydrogen peroxide as the chemical agents producing injury. Recent studies have demonstrated that the release of hydrogen peroxide by activated granulocytes causes the lysis of a number of different cell types. Possible therapeutic implications of these theories are considered.

81-1358. Burke, M. D. (Dep. Pharmacol., Marischal Coll., Univ. Aberdeen, Aberdeen AB9 1AS, Scotland) **Cytochrome P-450: a pharmacological necessity or a biochemical curiosity?** *Biochem. Pharmacol.* 30(3): 181-187; 1981 (98 references).

A review is presented of studies designed to determine whether cytochrome P-450 can metabolize drugs and chemicals in man and animals *in vitro* and *in vivo*. Eleven different lines of evidence involving 118 drugs and other chemicals provide circumstantial evidence that animal P-450 can metabolize these chemicals in the environment. The metabolism of parathion and warfarin is shown to be catalyzed by reconstituted purified P-450 systems and inhibited by specific antibodies against P-450 in animals. Evidence is not yet complete to confirm the probability of a significant drug-metabolizing role of P-450 in humans. There are 12 drugs, including warfarin, whose metabolism in man is possibly mediated in part by P-450. This conclusion is based on the induction of the metabolism of those compounds *in vivo* by phenobarbitone, which is able to induce *in vivo* human hepatic microsomal P-450. Problems encountered in this type of research include multiple forms of P-450, extrahepatic P-450, and interindividual variation in drug metabolism.

81-1359. Grigoreva, G. M. (I. M. Sechenov Inst. Evol. Physiol. & Biochem., USSR Acad. Sci., Leningrad, USSR) **Propionilkholinesterazy mozga bryukhonogikh mollyuskov. Vzaimodeistvie s substratami i ingibitorami. [Propionylcholinesterases from the brain of Gastropoda. Interaction with substrates and inhibitors.]** *Biokhimiya* 45(12): 2176-2188; 1980 (33 references) (Russian).

Brain propionylcholinesterases (PChE) of the gastropods *Lymnea stagnalis, Murex frunculus*, and *Rapana thomasiana* were used to study the kinetics of choline ester hydrolysis. The catalytic activities of PChE are characterized by high rates of hydrolysis of propionylcholine (PCh) and butyrylcholine (BCh) and, in *L. stagnalis*, a low rate of acetyl-β-methylcholine (AMCh). No hydrolysis of benzoylcholine occurred with any form of PChE. *M. frunculus* and *R. thomasiana* were unable to hydrolyze AMCh. The kinetic parameters, *Km, V* and *V/Km*, were compared with differences in the types of PChE for each organisms were determined. Rates of interaction with the cationic organophosphorus inhibitor Gd-2 and its cation-free analog, Gd-7, were also examined and differences among the 3 gastropod PChE kinetic parameters were observed. It is suggested that these differences are due to differing structural features of the anionic and esterase moieties at the active sites.

81-1360. Reznik, G.; Reznik-Schueller, H.; Ward, J. M.; Stinson, S. F. (Tumor Pathol. Branch, Carcinog. Test. Program, Natl. Toxicol. Program, NCI, Bethesda, MD 20205) **Morphology of nasal-cavity tumors in rats after chronic inhalation of 1,2-dibromo-3-chloropropane.** *Br. J. Cancer* 42(5): 772-781; 1980 (38 references).

Inhalation studies on the soil fumigant 1,2-dibromo-3-chloropropane (DBCP) were conducted. F344 rats (50 of each sex) were exposed to 0.6 or 3.0 pts/10^6 DBCP for 6 hr/day, 5 days/wk. Animals were sacrificed at 104 wk. Necropsies, and gross and microscopic examination of all major tissues, were performed. Light and electron microscopic examinations of the nasal cavity were performed. Neoplasms related to DBCP inhalation were found in the nasal cavity, tongue, pharynx, larynx and kidney. The morphology of nasal cavity lesions is described in detail. Up to 93% of the exposed rats developed nasal cavity neoplasms; most of the tumors were adenomas, squamous-cell papillomas, squamous-cell carcinomas and adenocarcinomas. In males, 78% of the tumors of the low-dose group and 89% of those in the high-dose group were benign. In females, 66% of tumors in the low-dose group and 76% of those in the high dose group were benign. Seventy-three percent of the carcinomas in males and 51% of those in females were found in invade through the cribriform plate into the cerebrum or metastasize to the regional lymph nodes. Electron-microscopic examination suggests that the basal cells of the olfactory epithelium may be the site of origin of the poorly differentiated adenocarcinomas.

81-1361. Anonymous **Angiosarcoma of the liver: a growing problem?** *Br. Med. J.* 282(6263): 504-505; 1981 (11 references).

A description is presented of angiosarcoma of the liver. Fewer than 200 of these tumors having been reported worldwide. It is noted that at least 3 compounds, thorotrast (a colloidal preparation of thorium dioxide), polyvinyl chloride, and arsenic, have been identified as causes of this angiosarcoma. Thorotrast is no longer in use, polyvinylchloride is used under safety regulations, and the use of arsenic pesticides in Britain has diminished. However, it is suggested more cases will appear, since the latent period is 12-29 yr. Presenting symptoms include abdominal pain and swelling, weight loss, enlargement of the liver, and ascites. The prognosis is not good; transplantation or resection are the only cures.

81-1362. Kamenov, D. A. (Author address not given) **Analiz deistviya nekotorykh pestitsidov na model'nye**

gruppy domovykh i zheltogorlykh myshei. [Analysis of the effect of pesticides on *Mus musculus* L. and *Apodemus flavicollis* Melch.] *Byull. Mosk. Ova. Ispyt. Prir. Otd. Biol.* 85(6): 24-30; 1980 (23 references) (Russian).

The eco-physiological mechanisms of adaptive response to the pesticides heptachlor (HC), simazine (SZ) and zoocoumarin (ZC; warfarin) were studied in populations of house and yellow-neck mice. HC and SZ were given with the fodder at doses of 270 and 240 mg/kg, respectively; ZC was given po at 70 and 260 mg/kg. Pesticide administration was found to increase 4-5-fold the blood level of free 11-hydroxyketosteroids. The extent of endocrine response depended upon pesticide dose, CNS type and species.

81-1363. Roslycky, E. B. (Res. Inst., Agric. Canada, London, Ontario N6A 5B7, Canada) **Fungicidal activity of Vorlex and accumulation of linuron in a Vorlex-linuron treated soil.** *Can. J. Soil Sci.* 60(4): 651-656; 1980 (23 references).

Recommended concentrations of Vorlex (methyl isothiocyanate) and linuron exerted little initial effect on bacterial and actinomycete populations in a muck, whereas Vorlex caused drastic reduction in that of the fungi. This resulted in linuron accumulation in the soil which was deleterious to growth of *Lactuca sativa* L. New fungal population produced by the survivors was resistant to subsequent Vorlex treatments, but was linuron passive. Proliferation of the surviving fungi was accompanied by appreciable and lasting increases in the bacterial and actinomycete populations. Absence of pathogenic symptoms on lettuce plants due to any of these organisms precluded selection or enrichment of pathogens potentially present in the soil. The findings demonstrated the consequence of this pesticide combination on non-target microbiota, the accumulation of linuron, and plant growth. (Author abstract by permission)

81-1364. Smith, A. G.; Carbral, J. (Biomed. Pharmacol. Sect., Toxicol. Unit, Med. Res. Counc. Lab., Carshalton, Surrey, England) **Liver-cell tumors in rats fed hexachlorobenzene.** *Cancer Lett.* 11(2): 169-172; 1980 (14 references).

Female Agus rats were fed a diet containing 100 ppm hexachlorobenzene (HCB) for up to 90 wk, followed by histological examination of tissues. The rats showed few external symptoms of toxicity, but body wt steadily declined to about 80% of that of control animals. After 3 mo, the urines fluoresced red under UV light, illustrating the onset of porphyria. All rats fed HCB had livers nearly twice the size of controls, and all developed multiple liver-cell tumors. In another group of 6 female MRC Wistar rats fed HCB, 4 developed liver-cell tumors, and the remaining 2 showed hepatocellular hypertrophy. All 4 control livers appeared normal. These data constitute the first evidence for the carcinogenicity of HCB in rats.

81-1365. Williams, G. M.; Telang, S.; Tong, C. (Naylor Dana Inst. Dis. Prev., Am. Heart Found., Valhalla, NY 10595) **Inhibition of intercellular communication between liver cells by the liver tumor promoter 1,1,1-trichloro-2,2-*bis*-(*p*-chlorophenyl) ethane.** *Cancer Lett.* 11(4): 339-344; 1981 (23 references).

Cultures of rat liver hepatocytes and 6-thioguanine resistant adult rat liver epithelial cell (ARL) Line No. 14 were established. Co-cultures of the cells were exposed to the liver tumor promoter DDT in WMES for 2 hr before 6-thioguanine at 10 γg/ml was added. The cells were grown for 2 days, and were re-dosed with WMES containing DDT and 6-thioguanine. A dose dependent inhibition of metabolic cooperation between cultured liver cells was observed. It is suggested that the effect of DDT on cell membranes may be the basis for its tumor promoting activity.

81-1366. Scott, J. M.; Weir, D. G. (Author address not given) **Drug-induced megaloblastic change.** *Clin. Haematol.* 9(3): 587-606; 1980 (108 references).

A review is presented of drugs which block DNA biosynthesis, resulting in megaloblastic change. Megaloblastic changes include the appearance of megaloblasts in the bone marrow, changes in the peripheral blood film, and a raised mean corpuscular volume. The drugs discussed are categorized by the following mechanisms of action; DNA assembly, ribonucleotide reduction, thymidylate biosynthesis, pyrimidine precursor biosynthesis and purine precursor biosynthesis. Some drugs, including arsenic and chlordane, induce megaloblastic changes by unknown mechanisms. Arsenic can cause reversible megaloblastic changes in association with folate deficiency, and in folate-replete subjects. In animals, arsenic has been found to block the incorporation of formate during the biosynthesis of purines. One case of a severe refractory megaloblastic anemia has been reported following extensive inhalation in exposure to chlordane. No obvious explanation exists for the megaloblastic changes, and both the folate and vitamin B_{12} status of the subject were normal.

81-1367. Shnaps, Y.; Gross, M.; Trau, H. (Sch. Med., Tel Aviv Univ., Tel Aviv, Israel) **Erythema multiforme due to pyrethrum.** *Clin. Pediat. (Philadelphia)* 20(1): 68; 1981 (3 references).

A case is presented of a 2-wk-old infant who developed an extensive rash which was believed to be an allergic reaction to the insecticide pyrethrum. The child's straw crib was sprayed with an estimated 100 g of pyrethrum-based insecticide. A maculopapular rash and elevated temperature were noted 12 hr after pesticide application. Following treatment with hydrocortisone the rash began fade; the patient recovered uneventfully. It is suggested that this case demonstrates another form of allergic reaction to this insecticide.

81-1368. Doherty, M. J.; Khan, M. A. Q. (Dep. Biol. Sci., Univ. Illinois, Chicago, IL 60680) **Hepatic microsomal mixed-function oxidase in the frog, *Xenopus laevis*.** *Comp. Biochem. Physiol. C* 68(2): 221-228; 1981 (23 references).

Hepatic microsomal mixed-function oxidase (MFO) of the frog, *Xenopus laevis*, appears to be similar to that of fish and mammals. However, the levels of protein in liver microsomes, and specific contents and activity of cytochrome P450, cytochrome *c* reductase, aldrin and chlordane epoxidase, and naphthalene and chlordene hydroxylase of frog liver are about 30-40% of these of male rats or mice and about 65% of that of the adult bluegill. The levels are extremely low in frog larvae but keep increasing after metamorphosis, reaching the adult levels between 9 and 12 wk after tail absorption. The levels of enzyme activity (measured with naphthalene, aldrin, dieldrin, and chlordene) correspond to the P450 concentration and not the level of cytochrome *c* reductase activity. In adult frogs the enzyme activity can be affected only slightly by diets. Inducers of P450 (hexobarbital) and P448 (β-naphthoflavone) cause about 50% increase in cytochrome P450 concentration but did not increase P450 catalyzed reactions. (Author abstract by permission)

81-1369. Casabe, N.; Zerba, E. N. (Lab. Entomotoxicol., CITEFA, Buenos Aires, Argentina) **Esterases of *Triatoma infestans* and its relationship with the metabolis of organophosphorus insecticides.** *Comp. Biochem. Physiol. C* 68(2): 255-258; 1981 (16 references).

The activity of eserine-resistant esterases and their inhibition by 10^{-5} *M* paraoxon in subcellular fractions of thorax and abdomen of *Triatoma infestans* were examined. Most of the activity per insect was found in the soluble fractions. The abdomen was the richer part of the body in esteratic activity. The influence of bivalent cations on the activity of the esterases was studied. Ca^{2+}, Mn^{2+}, and Co^{2+} activated hydrolases appear to be present in *T. infestans*. Disc electrophoresis of homogenates from thorax or abdomen resolved 9 bands with activity toward α-naphthylacetate. These were characterized as: 6 carboxyesterases, 1 acetylesterase, 1 arylesterase and 1 superimposed mixture of different types of esterases on the top. The hydrolytic activity of each band toward [^{14}C]parathion and [^{14}C]paraoxon was determined. Splitting of both substrates was only performed by the arylesterase corresponding to band IX. (Author abstract by permission)

81-1370. Pevny, I. (Dermatol. Klin. & Poliklin., Univ. Wuerzburg, DDR) **Pestizid-Allergie. Allergisches Kontaktekzem bei eim Winzerin. [Allergy to pesticides. Allergic contact eczema affliction of a vintner.]** *Dermatosen Beruf Umwelt* 28(6): 186-189; 1980 (20 references) (German).

Epicutaneous tests were performed on a female vintner afflicted with occupational eczema as a result of pesticide exposure. Sensitization and group allergy were detected. The contact eczema was characterized by diffuse erythematous, infiltrated, squamous skin lesions on the back of hands, underarm and on the face. The eczema disappeared 5 days after cessation of work in the vineyard. Sensitivity tests performed on the patient with 27 pesticides disclosed selective sensitivity to 7 compounds [parathion, methyl parathion, methidathion, azinphos-methyl, metasystox (demeton-S-methyl sulfone) EDTA and pyrethrum] and immunity to 20 compounds. This is reported to be the first proven case of allergic reaction to parathion. A group allergy is suggested due to the structural affinity of the first 5 sensitizing agents (organophosphate pesticides). The allergy to EDTA and pyrethrum is unexplained. Tests also revealed that the Pejo protective ointment containing fentichlor (dioxy-dichlorodiphenylsulfide) used by the vintner aggravated her condition.

81-1371. Caceci, T. (Georgetown Univ., Washington, DC) **Ultrastructural morphology of toxaphene-treated intestinal cells in the goldfish *(Carassius auratus).*** *Diss. Abstr. Int. B* 41(7): 2442-2443; 1981.

Goldfish *(Carassius aruatus)* were treated with the organochlorine insecticide toxaphene, in 2 ways; dissolved in the water of the tank, and by gastric intubation with toxaphene-laden corn oil emulsion. Static toxicity tests of dissolved toxaphene were performed at 5.0 ppb and 1.0 ppm for 96 hr. Toxaphene was dissolved in the test tank either alone, or in a corn oil vehicle. Exposure at 5.0 ppb caused no mortality in either case. Exposure at 1.0 ppm produced 2.5% mortality for toxaphene alone, and 95% mortality when introduced in the carrier. Fish treated orally were administered toxaphene-laden emulsions of corn oil and water at 1.5 mg/ml and 15 mg/ml. The latter emulsion produces 100% mortality within 24 hr. Fish treated with the 1.5 mg/ml emulsion were killed after 15, 30, 90 and 120 min, and 24 hr. Portions of the intestinal bulb were excised and examined in the electron microscope. The results were compared to sham-fed controls and fish starved for periods of to 70 days. The intestinal cells of treated fish show a marked development of very osmiophilic whorled structures that are derived from mitochondria and other membranous intracellular components. Starved fish show similar, though smaller and less dense, structures. These are similar in appearance and structure to myelin figures that have been reported by other authors and which are generally considered to be a non-specific response to a wide variety of environmental stresses. The possibility is discussed that the larger structures seen in toxaphene-treated fish may be a variant form. The action of toxaphene in inhibiting ATPases may enhance their formation, and intensify these structures. The hypothesis that they may constitute a temporary, emergency storage form of intracellular lipids derived from membranous organelles is considered. (Author abstract by permission. Copies of the thesis are available from University Microfilms, order No. 8101951).

81-1372. Lagunes Tejeda, A. (Univ. California, Riverside, CA) **Impact of the use of mixtures and sequences of insecticides in the evolution of resistance in *Culex quinquefasciatus* Say (Diptera: Culicidae).** *Diss. Abstr. Int. B* 41(7): 2471-2472; 1981.

A synthetic population of *Culex quinquefasciatus* was produced by incorporating 2% of the resistance genome of 3 strains that were fully resistant to temephos, propoxur and permethrin, respectively. Subcolonies of this synthetic population were selected with temephos, propoxur or permethrin, and with all possible mixtures and sequences of these insecticides. Selection of the synthetic strain by each of the 4 possible mixtures of temephos, propoxur, and permethrin registered different results. Selection by the mixture of temephos + propoxur showed significant delaying effects on the development of resistance. The colony selected by the mixture propoxur + permethrin showed a greater increase in resistance to each of the components than the levels attained through separate selection with each of the respective insecticides. Selection by the mixture of temephos + permethrin showed antagonistic interaction between these chemicals and high cross resistance to pyrethroids and organophosphates. The strain selected by the triple mixture of temephos + propoxur + permethrin showed faster development of resistance than was observed with the separate selection by the separate components. Data were also obtained on the effect of sequential selection by temephos, propoxur, and permethrin. From the analysis of the results in this study on the impact of mixtures and sequences of insecticides on the evolution of resistance, it is concluded that the use of mixtures should be avoided. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 8024989)

81-1373. Wang, T. C. (Texas A&M Univ., College Station, TX) **Biochemical genetics of insecticide resistance in house fly, *Musca domestica* L.** *Diss. Abstr. Int. B* 41(7): 2474; 1981.

A triple mutant strain of the house fly, *Musca domestica* L., with 3 visible recessive genes, ar, stw and car, on chromosome II was developed. With this strain, genetic tests were made to determine the order and map positions of those 3 genes as well as to locate the genes for insecticide resistance in relation to those mutants in 5 resistant strains. The gene order found in the results of all experiments was R-ar-stw-car. The R gene appeared to be at the same locus in all strains tested, regardless of the biochemistry of the particular strain involved. This suggested a common gene for all the strains tested in this experiment, most probably a regulatory gene. Significant difference in some map positions of the genes tested were observed between the organophosphate-resistant (OP) and -susceptible strains. Suppressions of crossing over between the ar and stw genes occurred consistently in the OP-resistant strains. Chromosome inversions were suggested to explain the phenomenon. A series of additional experiments was performed to obtain further understandings of these results. The outcome not only confirmed the previous results, but also showed that position effect might play a very important role in insecticide resistance in the strains tested. (Author abstract by permission. Copies of the thesis are available from University Microfilms, order No. 8101655).

81-1374. Mount, M. B. (Kansas State Univ., Manhattan, KS) **Investigations of diagnostic criteria for carbaryl toxicity in experimental animals.** *Diss. Abstr. Int. B* 41(7): 2509-2510; 1981.

Brain insecticide residues have been used to evaluate mortality from environmental organochlorine insecticides. Carbaryl, a commonly used carbamate insecticide, was studied for residue evaluation in poisoned animals. Since carbaryl is an anticholinesterase insecticide, measurement of brain ChE was important. To permit carbaryl analysis of numerous small tissue samples a specific method of carbaryl analysis was sought. Carbaryl-induced toxicity in experimental animals, with determination of carbaryl tissue levels and ChE activity, were then able to be performed to establish critical diagnostic parameters. Carbaryl residues and ChE activities were determined in mature male rats receiving 450, 800, or 1200 mg carbaryl/kg orally. Significant tissue residues were present 24-48 hr after dosing. Brain carbaryl levels of 5 ppm distinguished between surviving and fatally poisoned rats. Whole blood carbaryl concentrations decreased with storage time. Carbaryl residues and ChE activities were also studied in 9 sheep receiving 350 mg carbaryl/kg orally and in 7 sheep receiving varying oral doses of carbaryl. Rapid loss of carbaryl concentrations in whole blood indicated that carbaryl was rapidly metabolized in sheep. This was in contrast to the slower metabolism in rat tissue. The determination of normal ChE activities in domestic animals provided a reference for diagnosing animals with potential toxicity from AChE insecticides. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 8101749)

81-1375. Maiorino, R. M. (Univ. Arizona, Tucson, AZ) **Toxaphene metabolism by the bovine.** *Diss. Abstr. Int. B* 41(7): 2591; 1981.

The insecticide toxaphene is unique in that it is a complex mixture of at least 177 polychlorinated compounds. An extraction procedure that reproducibly isolates toxaphene from defibrinated whole blood is described. Results obtained from multiple gas liquid chromatographic peak analysis of toxaphene in blood samples from bovine liver perfusion experiments are discussed. The roles of bovine liver, rumen and microflora in the metabolism of toxaphene were studied. The electron capture detector was used to monitor the appearance of toxaphene derived products and the disappearance of toxaphene components. Liver perfusion experiments revealed that the bovine liver

rapidly takes up toxaphene components at different rates from blood followed by a rapid rate of partial dechlorination. *In vitro* rumen fluid studies demonstrated that rumen microorganisms are affective in converting toxaphene components to dechlorinated derivatives. The liver perfusions and rumen fluid incubations proved to be excellent sources of toxaphene metabolites. In contrast, storage of toxaphene in depot fat gave no evidence of toxaphene degradation. Feeding studies at two different toxaphene intake levels revealed that milk was a major route of toxaphene excretion and both rumen microflora and the liver were major sites of toxaphene metabolism in the dairy cow. Milk and depot fat were found to contain mainly toxaphene components resistant to reductive dechlorination and dehydrochlorination and gave evidence of only a few toxaphene derived products. Toxaphene feeding studies also showed that a compartmental equilibrium was rapidly established between toxaphene in rumen fluid and that excreted in milk. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 8102237)

81-1376. Omann, G. M. (Univ. Minnesota, Minneapolis, MN) **Fluorescence spectroscopic investigations of chlorinated hydrocarbon membrane interactions.** *Diss. Abstr. Int. B* 41(7): 2593; 1981.

The physical interactions of chlorinated hydrocarbons with membranes were studied to gain insights into the mode of neurotoxic action of these compounds. The transfer of chlorinated hydrocarbons from particles to membranes was studied to obtain information on the mechanism of uptake of these compounds by organisms in the environment. DDT and methoxychlor were compared with DDE and lindane was compared with several of its inactive stereoisomers. The partition coefficients, diffusion coefficients, and saturation limits of the chlorinated hydrocarbons in the membrane did not correlate with their toxicities. The saturation limits of the membrane for a number of chlorinated hydrocarbons correlated with their solubilities in organic solvents. These results indicated that toxicity may not result from specific interactions between the chlorinated hydrocarbon insecticides and the membrane. The lipids of the membrane probably serve only to solubilize the chlorinated hydrocarbons in the hydrophobic region of the membrane. The partition coefficients of all the chlorinated hydrocarbons studied were higher in vesicles containing phospholipids with unsaturated fatty acyl chains. The neurotoxic effects of the chlorinated hydrocarbon insecticides are probably then due to specific interactions of these compounds with other membrane components. The transfer of chlorinated hydrocarbons (DDT, DDE, methoxychlor and PCBs) from particles to vesicles was also studied. Transfer of the chlorinated hydrocarbons from particles to vesicles was independent of the chlorinated hydrocarbon concentration. The transfer rate did not depend on binding of the lipid to particles and was independent of the lipid composition of the vesicles. The transfer rate of various chlorinated hydrocarbons correlated with their aqueous solubilities. These results indicated that the chlorinated hydrocarbons were transferred through the aqueous phase. The rate limiting step in transfer is judged to be the rate of solubilization of the chlorinated hydrocarbons from the particles. Adsorption of the chlorinated hydrocarbons onto particles may enhance the transfer rate by dispersing the chlorinated hydrocarbons and making them more available for solubilization into the aqueous phase. (Author abstract by permission, abridged. Copies of the thesis available from University Microfilms, order No. 8102145)

81-1377. Adamis, Z.; Lehotzky, K. (Natl. Inst. Occup. & Ind. Health, Budapest, Hungary) **A propaklor citotoxikus hatasanak vizsgalata peritonealis macrophagokon *in vitro*. [Study of the cytotoxic effect of propachlor on peritoneal macrophages *in vitro*.]** *Egeszsegtudomany* 24(3): 295-299; 1980 (8 references) (Hungarian).

The cytotoxic effect of recrystallized propachlor, Satecid 65WP formulation (AI propachlor), and of the Satecid 65WP vehicle on CFY rat peritoneal macrophages was studied *in vitro*. Unlike the vehicle, both propachlor and Satecid 65WP caused a significant cytotoxic effect. The TTC-RA_{50} value of Satecid 65WP was found to be 26 ± 5 μg. The serum concentration had a significant effect on the cytotoxicity; high serum concentrations exerted a protective effect. The cytotoxic effect of propachlor was already manifest at 10 μg/7 × 10^6 cells. The decrease in the lactate dehydrogenase activity as well as in the increase of the membrane permeability under the effect of pure propachlor and of Satecid 65WP, as measured by the erythrosin-B uptake of the macrophages, also proved the cytotoxic effect of propachlor. This is suggested to be the basis of the development of toxic skin reactions.

81-1378. Ikegami, S.; Nakamura, A.; Ono, S.; Nagayama, S.; Innami, S. (Div. Food Sci., Natl. Inst. Nutr., Shinjuku-ku, Tokyo, Japan) **[Effect of combination of PCB and BHC on vitamin A storage and lipid peroxide formation in liver of rats.]** *Eiyo to Shokuryo (Jpn. J. Food Nutr.)* 33(5): 327-333; 1980 (32 references) (Japanese).

The effect of combinations of PCB and other environmental contaminants on vitamin A storage and lipid peroxide formation was studied. Weanling male Sprague Dawley rats were given experimental diets containing 0-0.1% PCB and/or 0-0.01% β-BHC. Rats receiving < 0.01% BHC for 2-4 wk demonstrated no significant changes in body wt gain or vitamin A levels in liver or serum. Liver wt did increase significantly in rats fed the diet containing 0.01% BHC. Rats fed 0-0.1% PCB + 0.002% or 0.01% BHC showed that the PCB influence on body wt gain, liver wt and liver and serum vitamin A content was not potentiated by low concentrations of β-BHC. Diets containing 0.1% PCB caused induction of

cytochrome P-450 in liver microsomes; this was accelerated by the addition of 0.01% β-BHC. It is suggested from these results that BHC is metabolized by various pathways and PCB is mainly metabolized by the microsomal hydroxylating system.

81-1379. Singh, H.; Singh, T. P. (Fish Encodrinol. Lab., Dep. Zool., Banaras Hindu Univ., Varanasi, India) **Effects of two pesticides on testicular ^{32}P uptake, gonadotrophic potency, lipid and cholesterol content of testis, liver and blood serum during spawning phase in *Heteropneustes fossilis* (Bloch).** *Endokrinologie* 76(3): 288-296; 1980 (24 references).

The effects of two commonly used pesticides, Cynthion (50% malathion), and Hexadrin (20% endrin), on testicular activity, gonadotrophic potency, lipid content of testis and liver, and cholesterol content of testes, liver and blood serum during the spawning phase of the reproductive cycle in the fresh-water catfish *(Heteropneustes fossilis)* were investigated. Hexadrin was a more potent suppressor of testicular activity than Cythion. Significant decreases in ovarian radiophosphorus incorporation of hypophysectomized recipients indicated a low content of gonadotrophin in fish exposed to either chemical. Testicular lipid was increased significantly, but no apparent affect was noted on liver lipid. Large increases were noted in the cholesterol content of the testes, liver and blood serum after exposure to either chemical. The cholesterol accumulation in testis and blood appears to have resulted due to the pesticide-induced reduction in steroid production.

81-1380. Pritchard, J. B.; James, M. O. (Lab. Pharmacol., NIEHS, Research Triangle Park, NC 27709) **Factors determining the rate of excretion of anionic xenobiotics.** *Environ. Health Perspect.* 33: 326; 1979.

The winter flounder *(Pseudopleuronectes americanus)* was used to study the role of active transport, plasma binding and metabolism of DDA, 2,4-D and phenylacetic acid (PA). Those compounds were readily accumulated by isolated *in vitro* renal tubules. Metabolic inhibitors markedly reduced uptake. One major determinant of excretion was the active tubular transport on the renal organic transport system. The rate of transport and excretion was modified by plasma binding. Uptake of both DDA and 2,4-D were inhibited by the addition of plasma to the medium. Excretion rates were also altered by metabolism. No direct evidence was found to indicate that the taurine conjugates are more poorly excreted than their parent compounds. Differences in renal transport as modified by plasma protein binding account for the species differences encountered.

81-1381. Osborn, D.; French, M. C. (Nat. Environ. Res. Counc., Inst. Terr. Ecol., Monks Wood Exp. Stn., Abbots Ripton PE17 2LS, England) **The toxicity of the mothproofing chemical Eulan WA New to frog *Rana temporaria* tadpoles.** *Environ. Pollut. Ser. A* 24(2): 117-123; 1981 (5 references).

The toxicity of Eulan WA New was studied in frog tadpoles. Twenty tadpoles were placed in 1 *l* water and Eulan WA New was added at 1.0, 0.1, 0.01 or 0 mg/l. The water with the Eulan WA New was changed 3 times/wk. Significant decreases in movement of animals exposed to 1.0 mg/l were noted; these were only temporary. Feeding was reduced at all concentrations, and reductions appeared to be dose related. Mortality was dose related. Development was significantly slower in treated groups than in controls. Tail kinks occurred at a greater frequency in the 1.0 mg/l group than in the other treatment groups or the controls. Wild frogs could be affected by this compound if it accumulates to levels of 1-10 mg/kg in the environment.

81-1382. Stratton, G. W.; Corke, C. T. (Dep. Environ. Biol., Univ. Guelph, Guelph, Ontario N1G 2W1, Canada) **Interaction of permethrin with *Daphnia magna* in the presence and absence of particulate material.** *Environ. Pollut. Ser. A* 24(2): 135-144; 1981 (24 references).

Studies were conducted to determine the interaction of permethrin with *Daphnia magna* and particulate matter in the medium. Ten organisms/test were exposed to 0-10 μg permethrin/l. Mortality was determined after 48 hr. Particulates were added to some of the flasks during the toxicity tests. Results, when 10 *Daphnia* were exposed to 0.5 μg/l, were a mean of 6.3 dead when no particulates were added, 7.0 dead when either planktonic algae or bacteria were added, and 8 dead if silica powder was added. Adhesion of the particulates to *Daphnia* was observed for every type of particulate added. For comparative purposes, other pesticides were tested. Diazinon produced extensive debilitating clumping. Cypermethrin, methoxychlor and carbaryl produced less pronounced clumping which did not affect the *Daphnia.*

81-1383. Mohanty-Hejmadi, P.; Dutta, S. K. (Post-Grad. Dep. Zool., Utkal Univ., Vani Vihar, Bhubaneswar 751004, Orissa, India) **Effects of some pesticides on the development of the Indian bull frog *Rana tigerina.*** *Environ. Pollut. Ser. A* 24(2): 145-161; 1981 (28 references).

The toxicity of the pesticides metasystox (methyl demeton), malathion, Folithion (fenitrothion), Rogor (dimethoate) and Metacid (DDT + methyl parathion) to the Indian bull frog *Rana tigerina* was evaluated. Concentrations in which eggs could survive for 24 hr, and tadpoles could survive for 1 hr, were determined. Concentrations were then decreased; water and insecticide were changed 2 times/wk. Metasystox at concentrations of 0.001-0.00008% killed all tadpoles. At concentrations of 0.00007 and 0.00006% 30% of the tadpoles reached limb bud stage. At 0.00001%, 50% metamorphosis was attained. Egg

development occurred with malathion levels of 0.00001%; no survival past 56 days occurred. At 0.00003% malathion, 60% metamorphosis occurred. Folithion at 0.00001% allowed larval development and survival up to 22 days. Only 40% metamorphosis occurred in feeding stage tadpoles treated with 0.00002% Folithion. Eggs treated with 0.0003% Rogor showed 70% metamorphosis. Limb bud stage tadpoles treated with 0.001% and lower concentrations metamorphosed successfully, but were significantly smaller in size. Treatment of eggs with 0.00005% Metacid resulted in 20% metamorphosis. Treatment of feeding stage tadpoles with 0.00005% Metacid resulted in 60% metamorphosis. It was concluded that the insecticides caused a prolongation of life history and a reduction in size at metamorphosis at concentrations much lower than the dosage recommended for field application.

81-1384. Vasseur, P.; Erb, F.; Dequidt, J.; Aerts, C. (Serv. Virol., U 102, INSERM, Fac. Med., Lille, France) **Study of the acute toxicity of a dithiocarbamate (thiram) to human KB_3 cell cultures.** *Environ. Pollut. Ser. B* 1(3): 167-175; 1980 (12 references).

Cultures of human KB_3 cells were exposed *in vitro* to 0.5, 1, 2.5 and 10 ppm concentrations of thiram (tetramethylthiuram disulfide) dissolved in acetone for 30 min-3 hr. The cytotoxic effect was measured by the degree of ATP inhibition. The KB_3 cell sensitivity threshold was found to be $\approx$ 0.1 ppm thiram. ATP was determined following centrifugation of the suspension by a previously described method. The initial 10 ppm concentration reduced ATP by 99% after 2.5 hr, due to cell mortality. Reductions in concentration of 0.5-1.0 ppm caused ATP to drop by 90% after 40 min, and by 95% after 1.5 hr. Microscopic observation of the toxic effect disclosed progressive disorganization of the cytoplasm by random rearrangement into spherules, followed by migration of nuclear material. The choice of thiram solvent had no significant effect on the results.

81-1385. Wolthuis, O. L.; Benschop, H. P.; Berends, F. (Med. Biol. Lab. TNO, NL-2280 AA Rijswijk, The Netherlands) **Persistence of the anti-cholinesterase soman in rats; antagonism with a non-toxic simulator of this organophosphate.** *Eur. J. Pharmacol.* 69(3): 379-383; 1981 (5 references).

Anesthetized, atropinized male Wistar rats were poisoning with 6× LD50 soman. Purified acetylcholinesterase was injected iv 75 min after poisoning. Rapid inhibition of the acetylcholinesterase occurred. It was concluded that soman had been stored in the animal's body, to be released gradually over a period of time. In animals that had received oxime HI-6, the decrease of blood AChE activity was less rapid; about 100 min elapsed before all activity had disappeared. It was not determined whether the beneficial effect of HI-6 was due to inactivation of a fraction of the residual inhibitor, or whether HI-6 slowed the reaction with AChE by shielding the enzyme or by concomitant reactivation. It is suggested that the persisting inhibitor does not reside in the blood, but rather in some depot from which it is released back to the blood.

81-1386. Radwan, H. S. A.; Abo-Korah, S. M. (Plant Prot. Dep., Fac. Agric., Shebin El-Kom, Egypt) **Population dynamics of soil inhabiting mites in cucumber treated with granular insect growth regulators (IGRs).** *Experientia* 35(11): 1485-1487; 1979 (14 references).

Field investigations were carried out to determine the possible effects of insect growth regulators (IGRs) on beneficial soil inhabiting mites. A small area (0.005 acre; 2.025×10^{-3} ha) of cultivated cucumber was divided into 6 square plots; 5 were treated with IGRs or pesticides and one was used as a control. Three IGRs at 5 kg/acre (5 kg/0.405 ha) were tested, along with chlorpyrifos (a standard insecticide) at 5 and 20 kg/acre. At 2, 7, 15, 30 and 45 days post-treatment soil samples were collected. Mites were isolated from the soil and classified according to suborder. In treated plots there was a significant reduction at the 5% level in the mixed population of soil mites. The soil mites were more susceptible to the 3 IGRs tested than to chlorpyrifos. The various suborders of mites showed differential sensitivities to the IGRs.

81-1387. Fingerman, M.; Hanumate, M. M.; Deshpande, U. D.; Nagabhushanam, R. (Dep. Biol., Tulane Univ., New Orleans, LA 70118) **Increase in the total reducing substances in the hemolymph of the freshwater crab, *Barytelphus guerini*, produced by a pesticide (DDT) and an indolealkylamine (serotonin).** *Experientia* 37(2): 178-179; 1981 (10 references).

Studies to determine whether sublethal doses of DDT would increase the quantity of total reducing substances (TRS) in the hemolymph of the freshwater crab, *Barytelphusa guerini* and if so, whether this increase caused stimulation or inhibition of hyperglycemia hormone (HGH), were performed. DDT was injected into crabs (0.05 ml) at 0.01 mg/0.05 ml of 0.5% ethanol. Controls received 0.5% ethanol alone. Reserpine and serotonin (5-HT) were also injected. DDT and 5-HT significantly increased TRS concentrations. Reserpine significantly inhibited DDT from elevating TRS levels. Reserpine-DDT injected crabs had TRS levels not significantly different from ethanol injected crabs. It is suggested that DDT elevated TRS levels by triggering release of HGH from the sinus glands of the eyestalks. The proposed mechanism indicates that DDT causes repetitive firing in the presynaptic neurons that ultimately synapse with neurosecretory cells.

81-1388. Lantz, G. D.; Cunningham, G. R.*; Huckins, C.; Lipschultz, L. I. (Dep. Cell Biol., Baylow Coll. Med.,

Houston, TX 77030) **Recovery from severe oligospermia after exposure to dibromochloropropane.** *Fertil. Steril.* 35(1): 46-53; 1981 (19 references).

An investigation was carried out on 14 oligospermic men who had been involved in the production of the nematocide 1,2-dibromo-3-chloropropane (DBCP). The age range was 20-33 yr (mean 27.1 yr), and total exposure ranged from < 50 to 700 hr. Physical examinations and sperm counts were performed, blood samples were analyzed, accessory sexual gland function was evaluated by measuring specific substances in the seminal plasma, and scrotal exploration and testicular biopsies were performed. Seven of the men had extratesticular abnormalities which may have impaired their reproductive potential, while the remaining 7 had unexplained impaired testicular function. The degree of impairment of semen quality could not be correlated to the amount of DBCP exposure. Serum concentrations of testosterone were within the normal range. Testicular histology showed patchy tubular hyalinization with some continuing degree of spermatozoa formation. Sperm count improved 18-21 mo following last DBCP contact, suggesting that recovery of spermatogenesis is possible.

81-1389. Benyo, P. J.; MacKay, B. R. (Author address not given) **Vacor intoxication - chemical diabetes extraordinary.** *Guthrie Clin. Bull.* 50(3): 147-154; 1981 (18 references).

The development of ketotic insulin-requiring diabetes mellitus and autonomic nervous system toxicity in a previously healthy young woman who survived ingestion of 2 packets of Vacor (pyriminil) are described. Each of the packets she ingested contained 737 mg nitrophenyl urea (PNU). Nausea, abdominal cramping, dizziness and back pain began 3 hr after ingestion. At 6 hr diabetic ketoacidosis was diagnosed. After 2 days of intensive care the patient seemed somewhat improved, but labile diabetes persisted. A peripheral and autonomic neuropathy developed. Severe symptomatic orthostatic hypotension and dysphagia developed. Urological evaluation demonstrated a neurogenic bladder with complete failure of detrusor function. As an outpatient both the diabetes mellitus and autonomic neuropathy persisted. She currently receives regular and NPH insulin twice daily. Prompt emptying of the stomach by induced emesis followed by gastric lavage is indicated for all Vacor ingestions, followed by 30 ml of mineral oil plus a cathartic. Adult antidotal therapy includes nicotinamide 500 mg iv or im immediately followed by 100-200 mg iv or im every 4 hr for up to 48 hr. Nicotinamide should be given twice as frequently, should signs of toxicity develop. Small children should receive half the adult dose. Total nicotinamide should not exceed 3 g/-day. If nicotinamide is not available, niacin should be administered similarly.

81-1390. Czajkowska, A.; Walter, Z. (Dep. Biochem., Inst. Biochem. & Biophys., Univ. Lodz, PL-237 Lodz, Poland) **Effect of malathion on nucleic acid synthesis in phytohemagglutinin- stimulated human lymphocytes.** *Hum. Genet.* 56(2): 189-194; 1980 (41 references).

The effects of malathion on human nucleic acid synthesis was studied. Leukocytes were separated from human blood, then the lymphocytes and plasma were separated from the rest of the leukocytes. After incubation for several days, phytohemagglutinin (PHA) was added. Malathion was added to the cultures at 10-70 μg/ml before the addition of PHA, or at various times during incubation. Synthesis of nucleic acids was estimated by scintillation methods, based on ^{3}H incorporation into the TCA precipitate. The addition of PHA to cell cultures induced a high rate of mitosis. Increasing concentrations of malathion (30, 50 and 70 μg/ml) added to cultures during the resting phase of mitosis 24 hr before PHA was added decreased thymidine by 73%, 86%, and 85%, and uridine by 12%, 44% and 26%, respectively. Ten μg/ml malathion increased nucleic acid synthesis; thymidine increased by 4% and uridine by 22%. When malathion (50 and 70 μg/ml) was added to the cultures 48 hr before PHA, thymidine decreased 43% and 72% and uridine decreased 45% and 64%, respectively. When malathion was added at the beginning of the culture period, all levels caused decreased nucleic acid synthesis. Malathion was concluded to interfere with nucleic acid synthesis and various metabolic processes of the cell.

81-1391. Hamid, F. M. A.; Farghaly, M.; Alifi, L. M. (M. E. Reg. Radioisot. Cent., Dokki, Cairo, Egypt) **Fate and persistence of carbaryl residues in milk, fat and meat of lactating goats.** *IAEA-218 Conf. Rep.* 7804117: pp. 29-37; 1979 (10 references).

Lactating goats were fed ^{14}C-carbaryl for 7 consecutive days; 2 goats received 5 ppm and 4 goats recieved 15 ppm. Milk samples were collected twice daily, and urine and fecal samples at 1, 7 and 14 days after initial carbaryl feeding. Tissue samples were collected after sacrifice. All samples were analyzed for radioactive residues by liquid scintillation counting. Thin layer chromatography was used to characterize the residues obtained from milk extracts and urine. A good correlation was found between dietary intake and milk residues. Urinary levels suggest a possible rapid elimination of carbaryl; urinary levels were 1.000, 1.686, and 0.300 ppm 24 hr after initial dose, 24 hr after last dose, and 7 days after last dose, respectively. The highest residues were found in liver, kidney, omental fat and sc fat (0.184, 0.166, 0.120 and 0.164 ppm, respectively).

81-1392. Hassan, A.; Zayed, S. M. A. D.; Mostafa, I. Y. (M. E. Reg. Radioisot. Cent., Dokki, Cairo, Egypt) **Toxicological assessment of leptophos residues in cotton seed products.** *IAEA-218 Conf. Rep.* 7804117: pp. 63-71; 1979 (8 references).

Experiments were carried out to characterize the nature of leptophos residues in cotton seed products, and to evaluate residual toxicity in terms of lethality and cholinesterase inhibition. Radio-thin-layer chromatographic studies on oil from plants previously treated with ^{14}C-leptophos revealed the presence of leptophos, O-methyl phenyl phosphonothioic acid, 4-bromo-2,5-dichlorophenol and an unknown metabolite. The median lethal dose of leptophos, leptophosoxon, desbromoleptophos and 4-bromo-2,5-dichlorophenol were determined in male albino mice. Leptophos and its debrominated derivatives were found to be the most toxic compounds; the LD50s were 54 and 38 mg/kg, respectively. Leptophosoxon was found to be the most important brain acetylcholinesterase inhibitor.

81-1393. Hassan, A.; Farchaly, M.; Mohammed, S. I. (M. E. Reg. Radioisot. Cent., Dokki, Cairo, Egypt) **Leptophos residues in milk and meat of lactating goats.** *IAEA-218 Conf. Rep.* 7804117: pp. 73-83; 1979 (6 references).

The deposition of leptophos residues in milk and meat of lactating goats was studied. Two goats were fed 5 ppm and 4 goats were fed 10 ppm ^{14}C-phenyl leptophos in their diet for 7 consecutive days. Milk samples were collected twice daily. After sacrifice the major organs, lean muscle and fat were sampled. ^{14}C-Activity was determined in all samples by liquid scintillation counting. Radio-chromatographic techniques were used to characterize and identify metabolites in milk, fat and urine. During the intoxication period, leptophos levels in milk ranged from 0.10 to 0.42 ppm. After a withdrawal period, 7 days, levels were 0.06-0.08 ppm. It was shown that milk residues consisted of lipophilic compounds (57%), hydrophilic compounds (39%), and ^{14}C-protein-bound activity (4%). The lipophilic component consisted mainly of leptophos. Lean meat contained 0.03-0.40 ppm leptophos. Sc fat contained up to 5.9 ppm. Liver contained as high as 15.0 ppm. Urinary metabolites included phenylphosphonic, O-methyl phenyl phosphonic and O-methyl phenyl phosphonothioic acids, and 2 unknown products. It is suggested that the fate and magnitude of milk residues after processing into buttermilk, butter, yogurt, cheese, and cream should be studied.

81-1394. Saxena, A. K.; Sarin, K. (Dep. Zool., Univ. Rajasthan, Jaipur 302004, India) **Pathological and biochemical changes in the liver and testes of the desert gerbil *Meriones hurrianae* (Jerdon): effect on a single intraperitoneal injection of phorate (Thimet).** *Indian J. Exp. Biol.* 18(9): 1001-1004; 1980 (15 references).

Adult male Indian desert gerbils received single doses of phorate at 2.5 mg/kg ip in 0.1 ml olive oil; controls were dosed with olive oil only. Gerbils from each group were sacrificed at intervals of 3, 6, 12 and 24 hr, and 3, 5 and 7 days after treatment. Mortality was first noted at 24 hr. Clinical symptoms of intoxication were nausea, anoxia, incontinence, convulsions, and deep coma followed by death. Necropsy did not reveal any gross pathological changes, and the cause of death was not established. Livers of experimental animals contained more histopathological lesions than controls, including cytoplasmic degeneration, enlargement of the hepatocytes and vacuolization of the cytoplasm. Early signs of hepatotoxicity included mild enlargement of the hepatocytes with congested blood vessels at 12 hr after treatment. Damaged tubules were observed in the testes of the phorate-treated group and spermatogenic cell activity was decreased. The number of spermatogonia, spermatocytes and spermatids were markedly depressed. Significant increases in liver and testes alkaline and acid phosphatase activities were noted. ATPase activity decreases and glucose-6-phosphatase activity increases were also noted in testes of treated animals.

81-1395. Ghate, H. V.; Mulherkar, L. (Dep. Zool., Univ. Poona, Pune 411007, India) **Effect of sodium diethyldithiocarbamate on developing embryos of the frog *Microhyla ornata*.** *Indian J. Exp. Biol.* 18(9): 1040-1042; 1980 (15 references).

Naturally fertilized eggs of the frog, *Microhyla ornata* were collected and prepared for study. The developing embryos were treated with 0.1-5.0 mg/l of sodium diethyldithiocarbamate (DDC) for 96 hr. Several abnormalities were noted during development. The severity of the defects was dose dependent. The chemical was highly embryotoxic at 5 mg/l; severe retardation of growth and development was followed by death in 24 hr. At 3 mg/l all embryos survived 24 hr exposures but 50% mortality was noted during the subsequent period. All surviving embryos were highly retarded and malformed. Abnormal bending of the body axis, general edema and total lack of pigmentation were noted at 72 hr. Notochord development was completely abnormal. The tail was shortened and the tadpoles lay on one side at the bottom with spasmodic twitching of the body. At concentrations of 1-2 mg/l similar effects were noted, but were less severe. These results clearly indicate that the compound is a potent teratogen.

81-1396. Hemminki, K. (Inst. Occup. Health, Haartmaninkatul, SF-00290 Helsinki 29, Finland) **Occupational chemicals tested for teratogenicity.** *Int. Arch. Occup. Environ. Health* 47(3): 191-207; 1980 (98 references).

A review of the literature on the teratological testing of materials which constitute occupational hazards is presented. Materials reviewed included metals (sodium arsenate, cadmium chloride, copper sulfate, methylmercury chloride), plastics monomers and additives, solvents, and other industrially important organics (ethylene thiourea, TCDD, tetrachlorophenol, thiram, disulfiram). Results of teratological testing of these compounds are presented in tabular form. Several compounds, including

PCBs and warfarin, which are suspected of being teratogenic in man, are listed. The results of tests with animals, compared to levels of exposure, indicated that the regulations for many compounds were inadequate for the protection of pregnant workers. It is suggested that the methods of extrapolating test results to human tolerances are warrented in some cases, but that tolerances of pregnant workers are less than those considered in regulations.

81-1397. Wester, R. C.; Noonan, P. K.* (Searle Res. Dev., G.D. Searle, Skokie, IL) **Relevance of animal models for percutaneous absorption.** *Int. J. Pharm.* 7(2): 99-110; 1980 (38 references).

A review is presented of methods for determining percutaneous absorption. The validity of animal models for assessment of percutaneous absorption in humans is discussed. The major methods for measuring percutaneous absorption are the *in vitro* diffusion cell technique (involving use of excised human or animal skin or artificial membranes) and *in vivo* determinations (usually indirect by measuring radioactivity in excreta after topical application of labeled compound). Several parameters which affect percutaneous absorption are discussed, including drug concentration, surface area, skin condition, vehicle and metabolism. Comparisons of *in vivo* and *in vitro* studies carried out on humans and in laboratory animals are discussed in an attempt to determine whether animal models are predictive of results in humans. A study comparing the absorption of pesticides in rabbit, pig and squirrel monkey to results obtained in humans is discussed. DDT was a minimal penetrant in humans, showed very low absorption in the squirrel monkey, and considerably greater penetration in the rabbit and pig. Lindane penetration in the squirrel monkey was closer to that in humans. For parathion, the results in pig were most similar to humans. Malathion penetration was similar in pig and squirrel monkey, and could be predictive of that in humans. It is concluded that the common laboratory animals (rabbit, rat, guinea pig) show much higher percutaneous absorption than man; the pig and squirrel monkey are most predictive of levels observed in humans.

81-1398. Allahyari, R.; Hollinghaus, J. G.; Lapp, R. L.; Timm, E.; Jacobson, R. A.; Fukuto, T. R.* (Dep. Entomol., Univ. California, Riverside, CA 92521) **Resolution, absolute configuration and acute and delayed neurotoxicity of the chiral isomers of *O*-aryl *O*-methyl phenylphosphonothioate analogs related to leptophos.** *J. Agric. Food Chem.* 28(3): 594-599; 1980 (19 references).

The chiral isomers of *O*-methyl phenylphosphonothioic acid, *O*-(bromo-2,5-dichlorophenyl) *O*-methyl phenylphosphonothioate (leptophos), and *O*-(2,5-dichlorophenyl) *O*-methyl phenylphosphonothioate (desbromoleptophos) were prepared and their toxicological properties were examined. The absolute configuration of the enantiomers of leptophos and desbromoleptophos were assigned by relating them to the configurations of the corresponding *O*-methyl phenylphosphonothioic acids. The absolute configuration of the (-)-α-methylbenzylammonium salt of (-)-*O*-methyl phenylphosphonothioic acid was established by X-ray diffraction analysis. Optical purity was assessed by chiral pseudocontact lanthanide shift reagents and hydrolysis of the esters. The $(R)_P(+)$ isomers of leptophos and desbromoleptophos were more acutely toxic to the housefly and white mouse, while the $(S)_P(-)$ isomers were more delayed neurotoxic when administered ip to the hen. (Author abstract reprinted by permission of the American Chemical Society)

81-1399. Toia, R. F.; March, R. B.; Umetsu, N.; Mallipudi, N. M.; Allahyari, R.; Fukuto, T. R. (Div. Toxicol. & Physiol., Dep. Entomol., Univ. California, Riverside, CA 92521) **Identification and toxicological evaluation of impurities in technical malathion and fenthion.** *J. Agric. Food Chem.* 28(3): 599-604; 1980 (19 references).

In a continuing study on the toxicological effects of impurities in technical malathion, 3 additional phosphorus-containing compounds were identified by GC-MS and, together with 4 previously identified compounds, tested in mice. All potentiated the toxicity of purified malathion, though to varying degrees. *O,S,S*-Trimethyl phosphorodithioate was the most powerful potentiator, while *O,O,O*-trimethyl phosphorothioate was the weakest. A direct relationship between inhibition of mouse serum and liver malathion carboxylesterase activities and malathion lethality in mice was observed. Irradiation of malathion on glass or silicic acid surfaces by uv light gave rapid breakdown to 3 major products. Two of these were identified as *O,O,O,O*-tetramethyl pyrophosphorodithioate and *bis*(dimethoxyphosphinothioyl) sulfide. GC-MS analysis of technical fenthion (96%) allowed structural assignment to 4 phosphorus and 4 nonphosphorus containing impurities. However, toxicological studies suggest that potentiation phenomena are not involved for this material. (Author abstract reprinted by permission of the American Chemical Society)

81-1400. Mrlina, G.; Calmon, J. R. * (Lab. Chim. Org. Biol. & Phys. Chim. Sol., Ec. Natl. Super. Agron., F-31076 Toulouse, France) **Inhibition of acetylcholinesterase by *O*-(methylcarbamoyl) oximes. Structure-activity relationships.** *J. Agric. Food Chem.* 28(3): 673-675; 1980 (11 references).

Since the anticholinesterase activity and the mechanism of alkaline hydrolysis of *O*-(methylcarbamoyl) benzaldoximes and -acetophenoximes are analogous to those of phenyl *N*-methylcarbamates, these 2 groups of derivatives were compared by means of structure-activity relationships. The correlations with the electronic substi-

tuent parameter σ showed that the mechanism of inhibition of acetylcholinesterase (AChE) by *O*-(methylcarbamoyl) oximes is the same as that observed for phenyl *N*-methylcarbamates bearing strongly electron-withdrawing substituents. The correlations with the bimolecular rate constant k_{OH} suggest that the mechanism of the alkaline hydrolysis of oxime carbamates may closely parallel their mechanism of interaction with AChE at the serine hydroxyl. (Author abstract reprinted by permission of the American Chemical Society)

81-1401. Escobar, E. N.; Miller, R. W.; Leffel, E. C. (Dep. Anim. Sci., Univ. Maryland, Baltimore, MD) **Effects of feeding diflubenzuron on reproduction and growth of sheep.** *J. Anim. Sci.* 51(S1): 142; 1980.

The effects of the insect growth regulator diflubenzuron on sheep reproduction and growth rates were studied. Sheep were fed 100 ppm diflubenzuron for 7-8 mo from 4 wk prior to breeding to weaning. Diflubenzuron feeding did not affect conception, and had no significant effect on lambing rate or birth wt of lambs. No significant effects on blood parameters (erythrocyte and leukocyte counts, hemoglobin, packed cell volume, blood urea nitrogen, total protein, and total bilirubin) were noted. It was concluded that diflubenzuron did not affect production or growth of sheep. [Paper presented at the 72nd Annu. Mtg. of the Am. Soc. Anim. Sci.]

81-1402. Escobar, E. N.; Miller, R. W.; Leffel, E. C. (Dep. Anim. Sci., Univ. Maryland, Baltimore, MD) **Feeding diflubenzuron to swine: effects on reproduction and growth.** *J. Anim. Sci.* 51(S1): 142-143; 1980.

The effects of the insect growth regulator diflubenzuron on swine reproduction and growth was studied. Crossbred gilts and boars were fed 100 ppm diflubenzuron. Pigs were fed 0, 12.5, 25, 100 and 250 ppm diflubenzuron after weaning. Treated sows showed higher wt gain during gestation and higher number of pigs/litter than the controls. None of the feeding levels after weaning affected the general health of the animals, the average daily wt gain, or feed conversion. No effect of diflubenzuron was observed on blood parameters (erythrocyte and leukocyte counts, hemoglobin, packed cell volume, blood urea nitrogen, total protein, and total bilirubin). It was concluded that feeding diflubenzuron, at levels 4 to 10 times that required for fly control in animal manure, did not affect reproduction or growth of swine. [Paper presented at the 72nd Annu. Mtg. of the Am. Soc. Anim. Sci.]

81-1403. Thomas, P. E.; Reik, L. M.; Ryan, D. E.; Levin, W. (Dep. Biochem. Drug Metab., Hoffmann-La Roche Inc., Nutley, NJ 07110) **Regulation of three forms of cytochrome P-450 and epoxide hydrolase in rat liver microsomes.** *J. Biol. Chem.* 256(2): 1044-1052; 1981 (49 references).

A procedure is described for the preparation of nonspecific antibody directed against rat liver microsomal cytochrome P-450$_a$. In order to quantitate the 3 forms of cytochrome P-450, Long-Evans rats were treated with 7 different inducers, including γ-chlordane at 50 mg/kg ip on 4 consecutive days, then microsomal cytochrome P-450 was determined. The 3 forms were quantitated by a radial immunosuppressive assay. The data indicated that rats treated with γ-chlordane produced 1.9 nmol ΣP-450/mg protein; 4% was identified as P-450$_a$, 46% as P-450$_b$, 3% as P-450$_c$, and 47% as unknown P-450. In comparison, rats treated with Arochlor 1254 produced 3.5 nmol total P-450/mg protein; 7% was identified as P-450$_a$, 36% as P-450$_b$, 39% as P-450$_c$, and 18% as unknown P-450. It was demonstrated by Ouchterlony double diffusion analysis and immunoaffinity chromatography that there is a lack of immunological cross-reaction among the 3 forms of cytochrome P-450.

81-1404. Hinsdill, R. D.; Couch, D. L.; Speirs, R. S. (Dep. Bacteriol., Univ. Wisconsin, Madison, WI 53706) **Immunosuppression in mice induced by dioxin (TCDD) in feed.** *J. Environ. Pathol. Toxicol.* 4(2-3): 401-425; 1980 (30 references).

Four and 7-wk-old female, white, Swiss-Webster mice were used in studies designed to monitor numerous parameters for toxicity and immunological impairment due to exposure to TCDD, a contaminant of 2,4,5-T. The mice were given low doses (10-500 ppb) of TCDD in their diet over a period of 5 wk or more in an attempt to mimic the situation in which the toxicant becomes a component in the food chain. The animals were observed for overt toxicity, and bacterial challenges, serologic tests, and contact sensitization tests were carried out to determine the immunological effects of TCDD. Mice of both ages tolerated the 10 ppb dose without exhibiting any overt signs of toxicity, but there were indications of immunosuppression at this level, including reduction in primary and secondary antibody response to both tetanus toxoid and sheep erythrocytes. Higher exposures (100 ppb) resulted in marked suppression of total serum protein, γ-globulin and albumin, but β-globulin levels increased. In addition, contact sensitization to dinitrofluorobenzene and resistance to challenges of *Salmonella typhimurium* or *Listeria monocytogenes* were also lowered by TCDD feeding. There was no evidence for enhanced IgE synthesis in exposed animals.

81-1405. Hussain, M. A.; Oloffs, P. C.; Blatherwick, F. J.; Gaunce, A. P.; MacKenzie, C. J. G. (Dep. Biol. Sci., Simon Fraser Univ., Burnaby, British Columbia V5A 1S6, Canada) **Detection of incipient effects of anticholinesterase insecticides in rats and humans by electromyography and**

cholinesterase assay. *J. Environ. Sci. Health B* 16(1): 1-19; 1981 (29 references).

Rats were used as experimental models to determine whether electromyography (EMG) could detect changes at the neuromuscular junction before depressions in AChE and ChE occur during low level exposure to organophosphorus insecticides. Agricultural workers were monitored by EMG and by AChE and ChE determinations to establish the practicality and efficacy of EMG in the area of occupational health. Rats were fed technical diazinon at 0.5 or 5.0 mg/kg/day or technical parathion at 0.1, 0.5 and 1.0 mg/kg/day. Treatment was continued for 26 wk. For monitoring of human exposures, 16 private orchardists, 4 research scientists, and 10 orchard workers were observed. Diazinon depressed growth of rats more severely than parathion. Parathion at 0.1 mg/kg/day stimulated rat growth. Animals receiving 0.5 mg/kg diazinon/day had decreased AChE activities; 5.0 mg/kg/day resulted in severe depression of AChE activities. Parathion at 0.5 and 1.0 mg/kg/day caused immediate and severe AChE inhibition. Effects of parathion on ChE were much less severe. No EMG changes were detected with either chemical. Results of human monitoring showed significantly lower EMG and AChE activities. EMG and AChE activities were concluded to be suitable for investigation of occupational exposure to anticholinesterase agents.

81-1406. Stratton, G. W.; Corke, C. T. (Dep. Environ. Biol., Univ. Guelph, Guelph, Ontario N1G 2W1, Canada) **Effect of acetone on the toxicity of atrazine towards photosynthesis in *Anabaena.*** *J. Environ. Sci. Health B* 16(1): 21-33; 1981 (18 references).

The complex interactions that can occur between atrazine, the carrier solvent acetone, and the photosynthetic activity of 3 species of blue-green algae are discussed. The blue-green algae *Anabaena inaequalis, A. cylindrica,* and *A. variabilis* were treated with pesticide alone, acetone alone, or acetone + atrazine. The atrazine concentrations used were 0, 0.01, 0.05, 0.10 and 0.25 mg/l for *A. inaequalis,* and 0. 0.05, 0.10, 0.25 and 0.50 mg/l for *A. cylindrica* and *A. variabilis.* Each atrazine dose was interacted with acetone at 0, 0.10, 0.25, 0.50, 0.75 and 1.0% (v/v). The order of atrazine sensitivity was *A. inaequalis* > *A. variabilis* > *A. cylindrica.* Acetone and atrazine were found to interact additively, antagonistically and synergistically, depending on concentrations used. Solvent-pesticide interactions influenced the EC50 of atrazine towards photosynthesis.

81-1407. Couch, J. A.; Winstead, J. T.; Hansen, D. J.; Goodman, L. R. (Gulf Breeze Environ. Res. Lab., US EPA, Gulf Breeze, FL 32561) **Vertebral dysplasia in young fish exposed to the herbicide trifluralin.** *J. Fish Dis.* 2: 35-42; 1979 (20 references).

Studies were conducted on sheepshead minnows to investigate trifluralin induced vertebral dysplasia. Minnow zygote, embryo, larvae, juveniles, and young adults were exposed to the herbicide in concentrations ranging from 1.2 to 31 μg/l. Dysplasia occurred in minnows exposed to 5.5-31 μg/l from the zygote stage to the 28th day of development. Exposure to 16.6 μg/l for 51 days and depuration for 41 days resulted in no further increase in vertebral dysplasia during depuration. The dysplasia that occurred was characterized by semi-symmetrical hypertrophy of vertebrae, resulting in abnormal vertebral growth into the neural canal. Adult fish exposed to 16.6 μg/l experienced increased serum calcium levels. It is concluded that young fish are well suited for testing the effects of toxic substances on vertebrate development.

81-1408. Blaker, W. D.; Krigman, M. R.; Thomas, D. J.; Mushak, P.; Morell, P.* (Biol. Sci. Res. Cent., Univ. North Carolina, Chapel Hill, NC 27514) **Effect of triethyl tin on myelination in the developing rat.** *J. Neurochem.* 36(1): 44-52; 1981 (31 references).

Long-Evans rat pups were dosed with triethyl tin (TET) 1.0 mg TET/kg body wt/day to determine if the developing nervous system may be particularly sensitive to TET. Whole-brain cerebroside and 2′,3′-cyclic nucleotide-3′-phosphohydrolase (CNP) were assayed; their levels have been shown to increase in parallel with myelination during the development of the rat brain. Protein and tin levels were also determined. Electron microscopic examinations were made. When compared to controls, treated rats at ages of 16, 21 and 30 days showed decreases in body wt, forebrain wt, myelin yield, cerebroside level, brain CNP, and rate of myelin protein synthesis, relative to total brain protein. Forebrain myelin protein composition was not affected. TET treatment caused a decrease in myelin concentration of optic, but not sciatic, nerves and a decrease in spinal cord myelin. Starved controls were produced with a wt gain equal to that of the dosed rats. The starved controls showed less pronounced forebrain wt decrease, and little or no decrease in myelin concentration. It was concluded that the inhibition of forebrain growth and CNS myelination was more severe than could be accounted for by a general metabolic insult.

81-1409. Koelle, W. A.; Rickard, K. K.; Koelle, G. B.* (Dep. Pharmacol., Med. Sch., Univ. Pennsylvania, Philadelphia, PA 19104) **Effects of selective alkylphosphorylation of propionylcholinesterase on the regeneration of acetylcholinesterase in the aqueous soluble fraction of superior cervical ganglia of the rat following sarin.** *J. Neurochem.* 36(2): 402-405; 1981 (16 references).

Female Wistar rates treated with sarin were used in studies designed to test the effect of continual suppression of propionylcholinesterase (PrChE) by repeated administration of tetramonoisopropyl pyrophosphortetramide (iso-OMPA) on the rate of regeneration of

acetylcholinesterase (AChE) in the aqueous-soluble fraction of rat superior cervical ganglion (SCG). Sarin was used for inactivation of AChE and PrChE. Rats were treated with 2.0 μmol/kg sarin, sarin + iso-OMPA, or iso-OMPA alone. Rats were anesthetized, and SCG removed and assayed for AChE and PrChE 1, 3, 6 and 16 hr following the injection of sarin. Dosing with iso-OMPA alone produced 96-99% inactivation of PrChE, with no detectable effect on AChE. Significant suppression of AChE regeneration by iso-OMPA was noted only at 6 hr.

81-1410. Bellavite, P.; Berton, G.; Dri, P.; Soranzo, M. R. (Ist. Patol. Gen., Univ. Padova, Verona, Italy) **Enzymatic basis of the respiratory burst of guinea pig resident peritoneal macrophages.** *J. Reticuloendothelial Soc.* 29(1): 47-60; 1981 (50 references).

The enzyme reactions associated with respiratory burst of guinea pig peritoneal macrophages were studied. Macrophages, harvested by peritoneal lavage, were subjected to metabolic assays, activation by phorbal myristate acetate (PMA), protein determinations, and NAD(P)H oxidase activity measurements. The results of these studies indicate that a membrane-bound NADPH oxidase is responsible for the activation of the oxidative metabolism. Toxicity studies indicated that the oxidase was sensitive to the sulfhydryl reagent PCMBS, but azide, cyanide, antimycin or rotenone failed to inhibit the enzyme activity. These latter compounds were also ineffective on the oxidative metabolism of stimulated intact cells. The addition of 0.01 m*M* rotenone resulted in 82.1 ± 8.7% of control O_2 consumption by intact PMA-activated cells. The oxidase activity of 100,000 *g* particles from PMA activated cells was 93.6 ± 8.1% of control.

81-1411. Tanaka, R.; Nakai, K. (Dep. Pharmacol., Sch. Med., Akita Univ., Akita 010, Japan) **Comparison of carbaryl, dieldrin and paraquat on the absorption and protein binding in rats.** *Jpn. J. Pharmacol.* 30(S1): 223; 1980.

The absorption and protein binding of carbaryl, dieldrin and paraquat were studied in rats. Carbaryl was well-absorbed from the small intestine, and was found to bind to a small molecular wt compound in the cytosol fraction of intestinal mucosa to albumin, and partially to α_1,β_2-globulins in the serum. Dieldrin was slowly absorbed from the small intestine, showed no detectable binding to mucosal protein in cytosol, and in the serum was bound to lipoproteins, α_2,β_1-globulins, and partly to albumin. Paraquat showed more rapid absorption than dieldrin *in situ*, but showed the lowest absorption of the 3 compounds *in vivo*. Paraquat was present in the unbound fraction in the serum; in the cytosol fraction of the intestinal mucosa it was bound to a small molecular wt compound.

81-1412. Kluwe, W. M.; Hook, J. B. (Dep. Pharmacol. & Toxicol., Michigan State Univ., East Lansing, MI) **Effects of environmental chemicals on kidney metabolism and function.** *Kidney Int.* 18(5): 648-655; 1980 (35 references).

A discussion is presented of the effects of exposure to environmental pollutants on changes in renal biochemistry that may adversely affect kidney function. A brief description is given of metabolism and chemical toxicity. Enzymatic toxification and detoxification, reactive metabolism, and tissue injury are considered. Some environmental pollutants that increase renal xenobiotic metabolizing activities are listed, including chlorinated dibenzodioxins (TCDD; a contaminant of the herbicide 2,4,5-T), DDT and hexachlorobenzene. Administration of TCDD increases enzyme activities in both kidney and liver; greater increases occur in the kidney. TCDD is a potent inhibitor of renal AHH, but not EH or glutathione-S-transferase. Subtoxic amounts of TCDD may alter the balance between toxification and detoxification reactions, and may affect the nephrotoxicity of certain chemicals. TCDD has also been reported to affect active transport systems in the kidney. Although direct kidney injury by hexachlorobenzene has not been reported, it is known to be a potent inducer of renal microsomal enzymes, and may upset the balance between toxification and detoxification reactions.

81-1413. Doss, M.; Tiepermann, R. V.; Look, D.; Henning, H.; Nikolowski, J.; Ryckmanns, F.; Braun-Falco, O. (Lab. Clin. Biochem., Med. Sch., Philipps Univ., Marburg, BRD) **Hereditaere und nicht-hereditaere Form der chronischen hepatischen Porphyrie: Unterschiedliches Verhalten der Uroporphyrinogen-Decarboxylase in Leber und Erythrozyten. [Hereditary and non-hereditary form of chronic hepatic porphyria: different behavior of uroporphyrinogen decarboxylase in liver and erythrocytes.]** *Klin. Wochenschr.* 58(24): 1347-1356; 1980 (44 references) (German).

A study of 107 patients with hepatological and dermatological symptoms of chronic hepatic porphyria (CHP) aimed at differentiating between the hereditary and non-hereditary forms of the disease was based on porphyrino-bio-chemograms of urine and analyses of patient feces, liver and plasma. In CHP patients chronic liver damage induced by alcohol, estrogens or hexachlorobenzene was always associated with an uroporphyrinogen decarboxylase (UD) disturbance. The hepatic UD level decreased by 39-57% compared with controls; erythrocyte UD decreased by 30-50%. The non-hereditary form of CHP was accompanied by a UD decrease only in the liver. The decrease in UD activity in erythrocytes is attributed to inherited predisposition, and characterizes the hereditary form of CHP.

81-1414. Torok, G.; Borzsonyi, M.; Pinter, A.; Surgan, A.; Nadasdi, L. (Natl. Inst. Public Health, Budapest,

Hungary) **Peszticidbol keletkezett dinitrozopiperazin karcinogen hatasanak vizsgalata felnott Swiss egerekben es transzmateralis expozicio utan. [Study of the carcinogenic effect of dinitrosopiperazine formed from a pesticide in adult Swiss mice and following fetal exposure.]** *Mag. Onkol.* 24(4): 265-272; 1980 (30 references) (Hungarian).

The carcinogenic effect of 1,4-dinitrosopiperazine, a metabolite of the fungicide triforine, was studied in random-bred Swiss mice. The carcinogen was administered in drinking-water (100 mg/l) given *ad libitum*. Group A (50 males and 29 females) served as untreated controls. Group B (22 adult males and 14 adult females) were treated for 1 yr. Group C (12 males and 13 females) were exposed to the carcinogen transplacentally by treatment of their mothers between days 15-21 of pregnancy. Group D (19 males and 11 females) were exposed to the carcinogen during lactation by treatment of their mothers during this period. The experiment lasted 702 days. The mean survival was 397.3 days in group A, 254.2 days in group B ($p < 0.01$), 360.6 days in group C, and 355.8 days in group D. The percentages of tumor-bearing animals were 55.7% (38% for males and 86.2% for females) in group A, 69.4% (68.2% for males and 71.4% for females) in group B, 92% (91.7% for males and 92.3% for females) in group C ($p < 0.01$), and 93.3% (100% for males and 81.8% for females) in group D ($p < 0.01$). The mean latent period was 369.7 days in group A, 268.5 days in group B (< 0.01), 353.0 days in group C, and 366.0 days in group D. The percentage of lymphoma and leukemia was 32.9% in group A, 36.1% in group B, 64% in group C, and 40% in group D. The percentage of pulmonary adenoma was 12.7% in group A, 38.9% in group B, 28% in group C, and 63.3% in group D. Hepatoma was found in 7.6%, 8.3%, 12% and 53.3% of the animals in group A, B, C and D, respectively. Breast cancer was found in 7.6% of the females in group A and in 2.8% of the females in group B. Papilloma of the forestomach was found in 5.6% of the males in group B, in 4% of the males in group C, and 3.3% of the males in group D. The findings show that exposure of pregnant and lactating mothers to carcinogens may result in increased tumor incidence in the offspring.

81-1415. Bruno, O. D.; Hoschoian, J. C.; Andrada, J. A. (Inst. Invest. Med., Fac. Med., Univ. Buenos Aires, Buenos Aires, Argentina) **Effect of *o,p'*-DDD on plasma ACTH concentration in Cushing's disease.** *Medicina (Buenos Aires)* 39(2): 229-234; 1979 (15 references).

Case reports are presented of 2 patients with pituitary-dependent hyperadrenocorticism, who were treated with *o,p'*-DDD (TDE). It has previously been observed that long-term *o,p'*-DDD treatment induces a situation comparable to surgical adrenalectomy. During the treatment period, blood samples for the determination of plasma cortisol and ACTH concentrations were taken at intervals ranging from 6-22 days, for a total period of 265 days in one patient and 377 days in the second. Satisfactory remissions of hyperadrenocorticism were obtained. *o,p'*-DDD treatment normalized plasma cortisol concentrations, but did not cause an increase in plasma ACTH concentrations. It is suggested that *o,p'*-DDD may partially inhibit the hypersecretion of pituitary ACTH which characterizes Cushing's disease.

81-1416. Micks, D. W.; Moon, W. B.; McNeill, J. C., IV (Dep. Prev. Med. & Community Health, Med. Branch, Univ. Texas, Galveston, TX 77550) **Malathion tolerance *vs.* resistance in *Culex quinquefasciatus*.** *Mosq. News* 40(4): 520-523; 1980 (3 references).

Results are presented of a series of correlated laboratory-field tests as an evaluation model for differentiating between insecticide-tolerance and true resistance. Collections of *Culex quinquefasciatus* larvae were obtained for laboratory evaluations. Field tests were conducted with adults reared from highly malathion-tolerant collections. A wide range of malathion tolerance was found in the laboratory studies. Field studies demonstrated a wide range of resistance responses. Paired tests showed that 2 of the most malathion-tolerant strains were not malathion-resistant under field conditions. Problems with insufficient population sampling and misunderstanding of the significance of lab test results are indicated. It is suggested that this correlation lab-field approach might serve as a practical resistance evaluation model for other control programs.

81-1417. Rathor, H. R.; Toqir, G. (Pakistan Med. Res. Cent., Int. Health Prog., Lahore, Pakistan) **Malathion resistance in *Anopheles stephensi* Liston in Lahore, Pakistan.** *Mosq. News* 40(4): 526-531; 1980 (10 references).

Susceptibility tests for malathion were carried out on *Anopheles stephensi* from the Lahore region of Punjab Province to monitor the onset of malathion resistance. Initial tests made on the progeny of wild-caught females from 4 localities [Khano-Harni (KH), Shah-di-Khoi (SK), Kot Baghicha (KB) and Kahna Purana (KP)] indicated that *A. stephensi* from SK and KB were susceptible to malathion (100 and 97.1% mortality); those from KH and KP were resistant to malathion (37.8 and 27.9% mortality). Three susceptible colonized strains maintained in the laboratory were also subjected to susceptibility tests throughout the experiment; 100% mortality was demonstrated. The results indicate that *A. stephensi* from the Lahore area, Punjab, have become malathion resistant. *A. stephensi* from KH were chosen for further investigation to confirm physiological resistance. A 20-fold increase in resistance resulted after selection for malathion resistance for 3 generations in the laboratory.

81-1418. Manoucheri, A. V.; Shalli, A. K.; Al-Saadi, S. K.; Al-Okaily, A. K. (Dep. Environ. Health, Sch. Public

Health, Univ. Teheran, Teharan, Iran) **Status of resistance of anopheline mosquitoes in Iraq, 1978.** *Mosq. News* 40(4): 535-540; 1980 (17 references).

The current status of the DDT resistance of malaria vectors in Iraq was studied. Base-line data for the susceptibility of *Anopheles sacharovi* and *A. pulcherrimus* to malathion were determined. A series of susceptibility tests were carried out during March, April and May of 1978 in the southern, central and northern regions of Iraq. *A. sacharovi* and *A. pulcherrimus* were found to be susceptible to malathion; the LT95 to 5% malathion was estimated to be ≈ 15 and 31 min, respectively. *A. stephensi* was resistant to malathion. DDT resistance was noted in *A. sacharovi* and *A. pulcherrimus.*

81-1419. Ali, A.; Lord, J. (Agric. Res. & Educ. Cent., IFAS, Univ. Florida, Sanford, FL 32771) **Impact of experimental insect growth regulators on some nontarget aquatic invertebrates.** *Mosq. News* 40(4): 564-571; 1980 (18 references).

Adverse effects of 3 insect growth regulators (IGR) on the principal nontarget planktonic, nektonic and benthic invertebrates in experimental ponds, a sewage polishing pond, and a natural pond in central Florida were investigated. The IGRs studied included a 25% WP of diflubenzuron, 25% WP and 0.5% G of Bay SIR-8514, and emulsifiable concentrate (EC-4) of MV-678. Bay SIR-8514 at 56 and 112 g AI/ha and diflubenzuron at 28 and 56 g AI/ha reduced numbers of *Cyclops* sp., collembola, *Chaoborus* larvae and *Baetis* sp. nymphs in experimental ponds. Numbers of notonectids, corixids and coleoptera larvae in experimental ponds were also reduced by Bay SIR-8514, but were less severely affected by diflubenzuron. MV-678 at 56 and 112 g AI/ha was least harmful to the invertebrates. In the sewage pond treated with Bay SIR-8514 (WP) at 70 g AI/ha *Cyclops* spp. and *Hyalella azteca* (Saussure) numbers were reduced; *Cypridopsis* sp. and Oligochaeta were not affected. Treatment of the natural pond with 0.22 kg AI/ha MV-678 had no significant affect on numbers of *Diaphanosoma brachyurum* (Lieven), *Bosmina coregoni* Baird, *Ceriodaphnia* sp., *Diaptomus* spp., Hydrachnellae, Hirudinea and Oligochaeta in the natural pond.

81-1420. Miura, T.; Takahashi, R. M.; Mulligan, F. S., III (Mosq. Res. Lab., Univ. California, Fresno, CA 93727) **Effects of the bacterial mosquito larvicide, *Bacillus thuringiensis* serotype H-14 on selected aquatic organisms.** *Mosq. News* 40(4): 619-622; 1980 (9 references).

The effects of the use of *Bacillus thuringiensis* serotype H-14 deBarjac on some common aquatic organisms was tested. In a simulated field test an aquarium containing *Ceriodaphnia* sp., *Simocephalus* sp., *Cyprois* sp. and *Hyalella azteca* (Saussure) was treated with 5×10^3 spore/ml of *B. thuringiensis.* No detectable effects on the crustaceans were noted. Flowable formulations of *B. thuringiensis* were applied at 0.25 kg/ha with a hand sprayer to a plot containing an *Aedes* population. Another plot was treated at 1 kg/ha to a *Culex tarsalis* population. Population census of zooplankton, crustaceans, and immature aquatic insects in the treated plots showed no detectable adverse effects, with the exception of chironomid larvae. Chironomid larvae were killed within 2 days after treatment; the population began to increase rapidly after 2 days.

81-1421. Vasudevan, T.; Rajulu, G. S. (Dep. Zool., Univ. PG Cent., Coimbatore 641041, India) **The sulphur content of the larvae of the DDT-susceptible and resistant strains of *Anopheles fluviatilis.*** *Mosq. News* 40(4): 623-624; 1980 (6 references).

The sulfur content in larvae of susceptible and resistant strains of *Anopheles fluviatilis* was determined. The LC50 of the susceptible strain used was 0.004 ppm DDT at 21-24°C for 24 hr; that of the resistant strain was 0.04 ppm DDT. Sulfur analysis was done by the Carius method. Susceptible larvae contained 12.4 ± 3.6, 9.3 ± 2.4, 11.8 ± 2.9, and 10.6 ± 3.8 mg/g of sulfur in the 1st, 2nd, 3rd, and 4th instar larvae, respectively. Resistant larvae contained extremely high quantities of sulfur in all instars; 52.7 ± 12.4, 43.0 ± 5.6, 41.5 ± 7.3, and 46.6 ± 9.8 mg/g, respectively. No conclusion is made concerning the possible relationship between these differences in sulfur content and mosquito resistance to DDT.

81-1422. Loper, J. C. (Dep. Microbiol., Coll. Med., Univ. Cincinnati, Cincinnati, OH 45267) **Mutagenic effects of organic compounds in drinking water.** *Mutat. Res.* 76(3): 241-268; 1980 (84 references).

Possible mutagenic effects from organic compounds found in drinking water supplies are discussed. Mixtures of volatile and non-volatile organics are considered. Biological assessment of volatile and other known compounds is discussed. Known or suspected organic chemical carcinogens found in drinking water are presented in tabular form; included are dieldrin, Kepone (chlordecone), heptachlor, chlordane, DDT, BHC isomers, acrylonitrile, ethylene dibromide, aldrin, endrin and heptachlor epoxide. An NAS-NRC study on the adverse effects on health of drinking water contaminants, including 55 pesticides, is considered. Short-term bioassays, including the *Salmonella*/microsome mutagenicity tests and alternate procaryotic assays are discussed. The detection of *Salmonella* mutagens in unconcentrated drinking water is considered. A discussion of the mutagenicity of organic residues is presented, including isolation of residues, sorption/desorption on XAD and other resins, reverse osmosis concentrates, role of disinfection in mutagen formation and mutagen isolation and identification. It is concluded that evidence for mutagenicity of drinking water com-

ponents is broadly based. Positive data exists for residues in drinking water prepared from a variety of surface and ground waters; water expected to be contaminated with industrial or municipal discharges, or urban, agricultural or natural run-off, worldwide.

81-1423. Rannug, U. (Environ. Toxicol. Unit, Wallenberg Lab., Univ. Stockholm, S-10691 Stockholm, Sweden) **Genotoxic effects of 1,2-dibromoethane and 1,2-dichloroethane.** *Mutat. Res.* 76(3): 269-295; 1980 (106 references).

Information on the genotoxic effects of the structural analogs 1,2-dibromoethane (1,2-DBE; ethylene dibromide) and 1,2-dichloroethane (1,2-DCE; ethylene dichloride) is reviewed. The primary uses of 1,2-DBE are as a soil and grain fumigant, and as a lead scavenger in gasoline. Chemical and physical properties, and information on production, use and occurrence in the environment, are presented. The mutagenicity of the compounds in microorganisms, higher plants, *Drosophila*, and mammalian systems *in vitro* and *in vivo*, is discussed. The interaction of 1,2-DBE with phage RNA is also considered. Results of reproduction and carcinogenicity studies are presented. Information on the metabolism of these compounds is reviewed, including chemical analyses of metabolism *in vivo* and *in vitro*, binding studies, and characterization of the enzymes involved in the biotransformation. It is concluded that the monohaloaldehydes and glutathione conjugates derived from 1,2-DBE and 1,2-DCE are involved in the micromolecular binding and genotoxic effect of these chemicals.

81-1424. Ramel, C.; Drake, J.; Sugimura, T. (Author address not given) **An evaluation of the genetic toxicity of dichlorvos.** *Mutat. Res.* 76(3): 297-309; 1980 (75 references).

Information on the genetic toxicity of dichlorvos is reviewed. Chemical and physical data are presented, including chemical formula, synonyms and trade names, technical products and impurities, use and occurrence, and exposure level. Biological data from metabolic and pharmacokinetic studies in mammals and studies of methylating reactivity *in vitro* and *in vivo* are considered. Mutagenicity studies using dichlorvos or dichlorvos metabolites in microorganisms, *Drosophila*, plants and mammals *(in vitro* and *in vivo)* are discussed. Carcinogenicity studies are also presented. Three carcinogenesis investigations have been conducted, including 1 chronic inhalation study. No clear-cut carcinogenic effects in rodents have been found. The bacterial mutagenicity of dichlorvos is concluded to be explained by DNA methylation. DNA methylation generally occurs to such a low extent, however, that it is suggested not to be a specific hazard to humans. Continued tests, particularly *in vivo* studies, are recommended.

81-1425. Jung, R.; Beermann, D.; Glatt, H. R.; Oesch, F.* (Sect. Biochem. Pharmacol., Inst. Pharmacol., Univ. Mainz, D-6500 Mainz, BRD) **Mutagenicity of structurally related oxiranes derivatives of benzene and its hydrogenated congeners.** *Mutat. Res.* 81(1): 11-19; 1981 (33 references).

The mutagenicity of 17 closely related oxiranes were determined in 4 tester strains (*Salmonella typhimurium* TA98, TA100, TA1535, TA1537). The test compounds comprised all possible oxides of benzene and its partially hydrogenated congeners. The test compounds contain structural elements of many products, including the substituted cyclohexane oxides, such as dieldrin. In TA100 and TA1535, 12 of the tested oxiranes were weak to moderate mutagens. Four of these were also active in TA98. No mutagenicity was observed with the remaining 5 compounds in any of the 4 strains. The presence of a double bond in formal conjugation with the epoxide ring increased the mutagenicity relative to that of the saturated oxirane. Interestingly, additional epoxide rings within the same molecule did not markedly increase the mutagenic activity, and for the oxiranes that are not activated by a double bond, the relationship between mutagenic activity and the number of epoxide rings in the molecule was inverse. The influence of bromo and hydroxyl substitution on oxirane mutagenicity is discussed. Most notably, a compound having a 4-hydroxyl group in *syn* position to a 1,2-epoxide ring fused to the cyclohexane ring, a structure which as been suggested to increase the electrophilic reactivity of dihydrodiol epoxides through hydrogen bonding, was almost inactive. (Author abstract by permission)

81-1426. Ochi, T.; Umeda, M.; Masuda, H.; Endo, H. (Fac. Pharm. Sci., Teikyo Univ., Kanagawa 199, Japan) **Induction of chromosomal aberrations and 8-azaguainine resistant mutations by aryldialkyltriazenes in cultured mammalian cells.** *Mutat. Res.* 88(2): 197-209; 1981 (24 references).

Inducibility of chromosomal aberrations, cell survival, and mutation to 8-azaguanine (8AG) resistance in cultured V79 cells by 1-phenyl-3,3-dimethyltriazene (PDMT), 1-phenyl-3,3-diethyltriazene (PDET), and 1-(pyridyl-3)-3, 3-diethyltriazene (PyDET) were examined with or without metabolic activation. Chromosomal aberrations were induced in a dose-dependent manner by all 3 triazenes in a direct treatment for 24 hr. Chromosomal aberrations were also induced by PDMT with metabolic activation for 3 hr, and little differences in the incidences were observed compared with those obtained by direct treatment. All 3 triazenes were slightly mutagenic with direct treatment for 24 hr. In metabolic activation experiments, however, PDMT and PyDET were highly mutagenic. The mutagenicity, when compared with the cytotoxicity, was significantly higher in a metabolic activation system than in a direct treatment. (Author abstract by permission)

81-1427. Arenaz, P.; Nilan, R. A. (Dep. Agron. & Soils, Washington State Univ., Pullman, WA 99164) **Effect of sodium azide on sister-chromatid exchanges in human lymphocytes and Chinese hamster cells.** *Mutat. Res.* 88(2): 217-221; 1981 (21 references).

Human whole blood and Chinese hamster K1 cell line were exposed for 4 and 2 hr, respectively, to various concentrations of sodium azide ranging from 10^{-3} to 10^{-7} *M*. Cells were harvested and chromosomes stained by the FPG technique. In human lymphocytes, concentrations above 10^{-4} induced lethality whereas the K1 cell line was sensitive to concentrations above 10^{-5} *M*. The lower concentrations of azide produced no significant increase in sister-chromatid exchange (SCE) frequency above controls. Concurrent mitomycin C treatments produced significant increases in SCE levels. This apparent lack of induction of SCEs above background combined with previous data demonstrating negative clastogenic but very positive mutagenic activity of azide confirms the uniqueness of this mutagen. It would appear that azide is one of a few known potent mutagens that does not increase SCEs and/or break chromosomes. (Author abstract by permission, abridged.)

81-1428. Chen, H. H.; Hsueh,. J. L.; Sirianni, S. R.; Huang, C. C. (Dep. Exp. Biol., Roswell Park Mem. Inst., Buffalo, NY 14263) **Induction of sister-chromatid exchanges and cell cycle delay in cultured mammalian cells treated with eight organophosphorus pesticides.** *Mutat. Res.* 88(3): 307-316; 1981 (22 references).

Induction of sister-chromatid exchanges (SCE) and cell cycle delay in Chinese hamster cell line V79 after treatment with 8 organophosphorus pesticides (OPP) were studied. In addition, these effects were also studied using 1 of the 8 OPP in 2 human lymphoid cell lines. In V79 cells, 6 of the 8 OPP induced significant increase of frequencies of SCE and all the OPP induced various degrees of cell cycle delay. The 6 OPP in decreasing order of SCE induction are methyl parathion, demeton, trichlorfon, dimethoate, malathion and methidathion. The 2 OPP that had no effect on SCE are diazion and disyston (disulfoton). The extents of induced cell cycle delay are generally related to the OPP concentrations but does not necessarily correlate with the extent of induction of SCE among the OPP studied. The results of studies on the effect of methyl parathion on SCE and cell cycle delay in 2 human cell lines showed that both lines had significant and dose-dependent increase of SCE frequencies similar to those observed in V79 cells. In contrast to V79 cells, however, cell cycle delay was not as prominent in the human lines at comparable doses. These studies indicated that 5-bromodeoxyuridine labeling for analyzing SCE and cell cycle delay is a very sensitive method in assessing mutagenic potential of environmental compounds especially those that are highly toxic to and rapidly degradable in mammalian cells such as OPP. (Author abstract by permission)

81-1429. Mulleavy, P.; Collins, O. R. (Mushroom Res. Lab., Produce Prod. Div., Ralston Purina Co., St. Louis, MO 63188) **CIPC-induced and spontaneously produced diploid myxamoebae in a myxomycete, *Didymium iridis*: a study of mating-type heterozygotes.** *Mycologia* 73(1): 62-77; 1981 (38 references).

The use of isopropyl N-(3-chlorophenyl)carbamate (CIPC; chlorpropham), a herbicide which disrupts microtubule organization in plants, to create polyploid lines in a myxomycete is described. This type of clone is useful in the study of apogamic development and of the effects of myxamoebal mating-type heterozygosity. Two haploid myxamoebal clones of *Didymium iridis* which carried the same recessive plasmodial-color alleles (b^2) but different mating types (A^7-A^8) were diploidized with CIPC treatment. They were then crossed to produce a 4N, cream-colored plasmodium. Seventeen of the 23 F_1 myxamoebal progeny formed plasmodia in single-spore culture, and 6 did not. The 17 diploid apogamic, plasmodium-forming clones were heterozygous for mating type (A^7A^8), and all produced cream-colored plasmodia.

81-1430. NCI, Bethesda, MD **Bioassay of malathion for possible carcinogenicity.** *NCI Tech. Rep. Ser.* 192: 72 pp.; 1979 (28 references).

The results of the bioassay of malathion conducted for the Carcinogenesis Testing Program are presented. Malathion was fed at 2000 or 4000 ppm to F344 rats for 103 wk. Observations were continued for 2-3 wk after feeding of the chemical was stopped. All surviving rats were killed at 105 or 106 wk. The dosed group displayed no incidence of tumors in either sex in excess of that occurring among the control group. Toxic effects were not noted in the female rats. Male rats demonstrated decreased mean body wt, increased mortality, gastritis and gastric ulcers. These symptoms were dose dependent. It was concluded that under the conditions of this bioassay malathion was not carcinogenic in male or female rats. It was suggested that the females might not have received a maximum tolerated dose.

81-1431. Gramoni, R. (Inst. Soc. & Prev. Med., Univ. Geneva, Geneva, Switzerland) **Retinal function of rats exposed to organomercurials.** In: *Neurotoxicity of the Visual System*. Merigan, W. H., and Weiss, B., eds. (Raven Press: New York, NY): pp. 101-111; 1980 (29 references).

Wistar rats were used in studies designed to examine the retinal toxicity of the environmental pollutants methylmercury (MeHg) and phenylmercury (PhHg). One group of rats recieved subchronic sc injections of 1.0 mg PhHg borate/kg (0.59 mg Hg/kg)/day, daily for 7 wk. The MeHg study was similar; 0.5 mg CH_3HgCl/kg (0.4 mg Hg/kg)/day, 6 days/wk for 9 wk. Electroretinograms (ERGs) were recorded before dosing and at weekly inter-

vals during dosing. After sacrifice, Hg levels were determined in brain, eyes, liver and kidneys. In the PhHg study, no alteration of retinal function, determined by ERG responses, was observed. This was reflected in the low concentrations of Hg in brain (0.15 μg/g in controls, 0.29 μg/g in treated) and eyes (0.07 μg/g in controls, 0.15 μg/g in treated). In the MeHg experiments, changes were noted in 3 ERG parameters. The modifications did not appear to be specific to a single retinal layer. The Hg quantities from MeHg treatments were higher in the eyes (5.39 μg/g) than in the brain (4.19 μg/g).

81-1432. Finocchio, D. V.; Luschei, E. S.; Mottet, N. K.; Body, R. (Dep. Pathol. SM-30, Reg. Primate Res. Cent., Sch. Med., Univ. Washington, Seattle, WA 98195) **Effects of methylmercury on the visual system of rhesus macaque (*Macaca mulatta*). I. Pharmacokinetics of chronic methylmercury related changes in vision and behavior.** In: *Neurotoxicity of the Visual System*. Merigan, W. H., and Weiss, B., eds. (Raven Press: New York, NY): pp. 113-122; 1980 (13 references).

Adult female rhesus macaques *(Macaca mulatta)* were used to test the effects of methylmercury (MeHg) on the visual system, particularly the pharmacodynamic properties. Monkeys were given daily oral doses of MeHg at concentrations of 0, 50, 80, 90, 100 and 125 μg/kg/day. Clinical and behavioral observations were made daily, and every 2 wk mercury analysis (by atomic absorption spectrometry) and laboratory tests (hemogram, serum electrolytes, hepatic and renal function tests, and serum enzyme assays) were carried out. At necropsy, brain, spinal cord and other tissues were examined microscopically. Data showed the body burden of mercury to be proportional to dose. At doses of 0-100 μg/kg/day, the blood concentration reached a steady state, suggesting uptake and clearance of MeHg to follow linear, first-order kinetics. At 125 μg/kg/day, Hg blood levels continued to rise, suggesting a shift to zero-order kinetics. A good correlation was seen between body burden of mercury and degree of neurotoxicity; no toxic symptoms were observed at 50 or 80 μ/kg. At 90, 100 and 125 μg/kg/day doses, observed toxic symptoms included altered mastication, ataxa, and loss of vision. The half-life of MeHg at the 3 lowest doses was approximately 30 days, while at 100 μg/kg/day, the half-life was only 14 days.

81-1433. Shaw, C. M.; Mottet, N. K.; Chen, W. J. (Dep. Pathol., Med. Sch., Univ. Washington, Seattle, WA 98195) **Effects of methylmercury on the visual system of rhesus macaque (*Macaca mulatta*). II. Neuropathological findings (with emphasis on vascular lesions in the brain).** In: *Neurotoxicity of the Visual System* Merigan, W. H., and Weiss, B., eds. (Raven Press: New York, NY): pp. 123-134; 1980 (16 references).

Neuropathological findings in rhesus monkeys *(Macaca mulatta)* treated with methylmercury (MeHg) are reported. Group I (animals A, B and C) received daily doses of MeHg at 125 μg/kg body wt, and were sacrificed, when moribund with signs of severe neurotoxicity, at 102, 100 and 101 days. Group II (animals D, E and F) received daily doses of MeHg of 90-100 μg/kg for 285 days. Brain, spinal cord, eyes and samples of peripheral nerves were examined histologically after sacrifice. There were differences in the characteristics of lesions between the 2 groups, but the sites of lesions were relatively consistent in all animals. No lesions were found in the cerebellar cortex, brainstem, spinal cord, eyes or peripheral nerves of any animal. Lesions were observed in the cortices along the sylvian, calcarine and parallel sulci. Degeneration of subcortical white matter in the same areas was also noted. Focal cortical atrophy involving the cortices of the sylvian, parallel, and calcarine sulci were apparent in the brains of group II, but not group I, animals. The sites of these lesions correlate well with the reported clinical symptoms of poorly defined motor incoordination, such as clumsiness, stiffness, difficulty in drinking and chewing, abnormal postures, and peripheral scotomas. In addition, group II animals showed changes in blood vessels in the sylvian and calcarine sulci, indicative of the late stage of arrested methylmercurial encephalopathy.

81-1434. Evans, H. L.; Garman, R. H. (Inst. Environ. Med., Med. Cent., New York Univ., New York, NY 10016) **Scotopic vision as an indicator of neurotoxicity.** In: *Neurotoxicity of the Visual System*. Merigan, W. H., and Weiss, B., ed. (Raven Press: New York, NY): pp. 135-147; 1980 (32 references).

A discussion is presented of the use of impairment of scotopic vision (night vision) as an indicator of neurotoxicity. Early studies on carbon monoxide and LSD suggest that scotopic vision represents a function that is especially vulnerable to many different toxicants. A three-choice discrimination method was developed for evaluating this hypothesis using monkeys treated with methylmercury (MeHg). It was shown that at scotopic levels of illumination (dim), form discrimination accuracy began to decline after wk 10, while accuracy at bright illuminance continued unaffected during the first 20 wk of exposure. Brain-behavior correlations are discussed in an attempt to determine the probable physiological mechanism for this selective effect on scotopic discrimination. It is suggested that critical events in the cerebral cortex are responsible, and that these changes precede damage observed elsewhere in the visual system.

81-1435. Merigan, W. H. (Dep. Radiat. Biol. & Biophys., Med. Cent., Univ. Rochester, Rochester, NY 14642) **Visual fields and flicker thresholds in methylmercury-poisoned.** In: *Neurotoxicity of the Visual System*. Merigan, W. H., and Weiss, B., ed. (Raven Press: New York, NY): pp. 149-163; 1980 (28 references).

Monkeys were used in an attempt to develop a nonhuman primate model of methylmercury (MeHg) poisoning that would allow a quantitative description of the residual vision of victims and possibly to determine the most reliable early indices of visual loss. One female pigtail *(Macaca nemestrina)* monkey served as a normal control, and 2 female stumptail *(Macaca arctoides)* monkeys who had previously been exposed to MeHg were tested. The visual testing started approximately 3 yr after the end of MeHg exposure. Procedures are described for determining constriction of visual field and sensitivity to a flickering target. One of the treated monkeys showed no visual field constriction, while the other showed visual field constriction characteristic of human intoxication. This monkey also showed a dramatic loss of sensitivity to high flicker frequencies at all luminances and to low luminance flicker at all frequencies. The monkey with no field loss showed only an impairment of high flicker frequencies at high luminance. It is concluded that the determination of flicker fusion thresholds with a large flickering target would provide a reliable index of early MeHg poisoning.

81-1436. Tsutsui, J. (Div. Neuro-ophthalmol., Dep. Ophthalmol., Kawasaki Med. Sch., Kurashiki, Japan) **Clinical and pathological studies of eye movement disorders in Minamata disease.** In: *Neurotoxicity of the Visual System*. Merigan, W. H., and Weiss, B., eds. (Raven Press: New York, NY): pp. 187-202; 1980 (29 references).

A review is presented of the origin and signs of Minamata disease, with a detailed description of the neuro-ophthalmological signs. Minamata disease refers to the accidental methylmercury (MeHg) poisoning of inhabitants of the Minamata Bay area of Japan, due to ingestion of fish polluted by MeHg compounds discharged from an acetaldehyde plant. Mass MeHg poisonings have also occurred in the Niigata area of Japan, and in Iraq. Symptoms include sensory disturbances, ataxia, constriction of visual fields, confusion, and coma. Minamata disease affects the visual cortex and associated areas in the occipital lobe. The ophthalmological signs of Minamata disease include concentric contraction of the visual field, jerky pursuit, impaired pupillary near reflex, and the reduction of stereoactivity.

81-1437. Revzin, A. M. (Aviat. Toxicol. Lab., Civil Aeromed. Inst., FAA, Oklahoma City, OK 73125) **Effects of organophosphate pesticides and alcohol on visual mechanisms.** In: *Neurotoxicity of the Visual System*. Merigan, H., and Weiss, B., eds. (Raven Press: New York, NY): pp. 255-268; 1980 (33 references).

Various test animals were used to verify the hypothesis that the superior colliculus is an important target site for the toxic actions of organophosphorus pesticides. In the first set of studies, urethane-anesthetized animals (pigeons, gerbils, cats and squirrel monkeys) were exposed to brief, intense light flashes from a gas discharge tube, and flash-evoked activity was recorded from superficial layers of the left tectum. Following the response to the flash, an inhibitory pause was reduced when the animal was treated with the organophosphorus pesticide mevinphos. Atropine and other anticholinergic drugs increased the inhibitory phenomenon. In a second set of studies, urethane anesthetized, white Carneau pigeons were treated with various pollutants, and the response patterns of various types of cells in the nucleus rotundus were determined. Mevinphos blocked the directionally selective properties of the rotundal neurons, without affecting the spontaneous rate, maximum stimulated discharge frequency, or size specificity.

81-1438. Hasan, M.; Ali, S. F. (Brain Res. Cent., Jawaharlal Nehru Med. Coll., Aligarh Muslim Univ., Aligarh 202001, India) **Organophosphate pesticide dichlorvos-induced increase in the rate of lipid peroxidation in the different regions of the rat brain: supporting ultrastructural findings.** *Neurotoxicology* 2(1): 43-52; 1981 (19 references).

Estimation of acetylcholinesterase activity following the administration of 3 different doses of dichlorvos was undertaken to establish an index of neurotoxicity of this chemical. Male albino rats of the Charles Foster strain were used. Three groups of rats were given 0.6, 1.5, and 3.0 mg/kg body wt dichlorvos ip daily for 10 days. Signs such as hyperexcitability to tactile stimuli, fasciculations, convulsions and ataxia were observed. Occasional congestion of the meninges and signs of minimal cerebral edema were noted. A dose-dependent inhibition of cholinesterase activity was found following dichlorvos administration. Dose-dependent increases in the rate of lipid peroxidation were noted in all brain regions, and increased incidence of lipofuscin-like pigment granules was discernible in the Purkinje cells of the cerebellar cortex.

81-1439. Huang, T. P.; Ho, I. K.; Mehendale, H. M. (Dep. Pharmacol. & Toxicol., Med. Cent., Univ. Mississippi, Jackson, MS 39216) **Assessment of neurotoxicity induced by oral administration of chlordecone (Kepone) in the mouse.** *Neurotoxicology* 2(1): 113-124; 1981 (14 references).

A systematic assessment of neurotoxicity induced by chlordecone in mice was made. Male ICR mice were given chlordecone by oral intubation at 10, 25 or 50 mg/kg/day. Tremors and hyperexcitability were noted at 1, 4 and 9 days after administration of chlordecone at 50, 25 and 10 mg/kg/day, respectively. Mortality began to occur on days 5, 7 and 13 after administration of 50, 25 and 10 mg/kg, respectively. Mice treated with different doses demonstrated the same cumulative effect on mortality ratings. The loss of body wt was greatest in mice receiving

the highest dose of chlordecone. Effects on motor coordination were dose-related. Chlordecone treatment enhanced the CNS hyperexcitability induced by pentylenetetrazol. These studies demonstrate that typical chlordecone-induced neurotoxicity symptoms can be demonstrated in laboratory mice.

81-1440. Morrissey, R. E.; Mottet, N. K. (Dep. Pathol. SM-30, Univ. Washington, Seattle, WA 98195) **Neural tube defects and brain anomalies: a review of selected teratogens and their possible modes of action.** *Neurotoxicology* 2(1): 125-162; 1981 (191 references).

The action of certain known or suspected teratogens in production of neural malformations is reviewed. Specific mention is made of ethylenethiourea (ETU), which is a degradation product of the ethylene-bisthiocarbamate fungicides used on food crops. It is a stable residue which has been detected on fruits and vegetables, is an oncogenic agent in mice and rats, and produces tumors selectively in the brain and spinal cord. ETU also affects the rat fetal nervous system transplancentally, causing brain tumors postnatally. Rat fetuses treated with 80 mg/kg showed a deficiency of nervous tissue. Portions of the brain were exencephalic, and the cerebellum was absent with a poor differentiation of cerebral lobes. Animals whose mothers were treated with 40 mg/kg showed similar, but less severe, deformities.

81-1441. Anonymous **Herbicide is real-risk to birds and people.** *New Sci.* 89(1240): 405; 1981.

Chicken eggs exposed to low doses of 2,4,5-T developed into chicks with impaired learning abilities. Humans are suggested to be about 3-fold more sensitive to 2,4,5-T than are chicks. Scientists gave single doses of 2,4,5-T at 7-53 mg/kg dose levels to chicks on days 8 or 15 of incubation. Several of the embryos died. Birth defects resulted, including depigmentation of the feathers or abnormal development of the legs. It is concluded that application of 2,4,5-T to Australian blackberries at the recommended application rates could expose the eggs of wild birds to 22 mg/kg, higher than the smallest dose found to damage the unborn chick.

81-1442. Kawano, M. (Dep. Hyg., Sch. Med., Univ. Tokushima, Tokushima, Japan) **[Toxicological studies on phthalate esters. I. Inhalation effects of dibutyl phthalate (DBP) on rats.]** *Nippon Eiseigaku Zasshi (Jpn. J. Hyg.)* 35(4): 684-692; 1980 (38 references) (Japanese).

Rats were exposed to the insect repellent dibutyl phthalate (DBP) at aerosol concentrations of 0.5 mg/m³ for 6 hr/day for 6 mo. In the high concentration group, rats exhibited smaller body wt gains and greater brain and lung wt compared to controls. Rats from the low aerosol concentration groups exhibited similar effects, but at relatively lower levels. High blood urea nitrogen, low serum cholesterol and high serum transaminase activities, as well as increased neutrophils, were also observed.

81-1443. Kawano, M. (Dep. Hyg., Sch. Med., Univ. Tokushima, Tokushima, Japan) **[Toxicological studies on phthalate esters. II. Metabolism, accumulation and excretion of phthalate esters in rats.]** *Nippon Eiseigaku Zasshi (Jpn. J. Hyg.)* 35(4): 693-701; 1980 (42 references) (Japanese).

A method for quantitative analysis of phthalate esters and their metabolites in rat urine was devised and used to determine metabolism, accumulation and excretion of the insect repellents diethyl phthalate (DEP) and dibutyl phthalate (DBP). When injected into the stomach, the compounds were metabolized to monoester and phthalic acid. These metabolites were then rapidly excreted in urine. When rats were exposed to DBP aerosol at 50 mg/m³ for 6 hr/day for 6 mo, DBP was found to accumulate in the internal organs. Greatest concentrations were found in the lungs and the brain. At aerosol concentrations of 0.5 mg/m³, DBP accumulation in the brain was slight.

81-1444. Arena, J. M. (Pediatr. Dep., Duke Univ., Durham, NC) **Drugs and chemicals excreted in breast milk.** *Pediatr. Ann.* 9(12): 452-457; 1980 (22 references).

The movement of various chemicals into breast milk, and through the milk to the infant, is discussed. The death of a number of breast-fed infants in 1956 in southeast Turkey whose mothers were poisoned by consumption of hexachlorobenzene treated seed is considered. A porphyrin was detected in the urine of affected persons. Environmental pollutants such as DDT have also been found in breast milk. However, recent studies have indicated no increase in DDT content worldwide. Methyl mercury is excreted in breast milk, and may produce the symptoms found in Minamata disease. PCBs have also been detected in breast milk; little is known about the toxic effects.

81-1445. Gobbetti, A. (Inst. Zool. & Comp. Anat., Univ. Camerino, Macerata, Italy) **Endocrine modifications produced by *o,p'*-DDT in the male adult rat.** *Pestic. Biochem. Physiol.* 14(2): 139-143; 1980 (17 references).

Adult male Sprague-Dawley rats were used in studies designed to evaluate the effects of *o,p'*-DDT on the endocrine system. Rats were given sc injections of *o,p'*-DDT (20 mg/0.5 ml) in sesame oil and sacrificed 8 hr later. Blood, gonads, adrenals, and brains were removed, and plasma (for determination of testosterone and estradiol) was prepared by centrifugation from heparinized blood. The adrenal glands were incubated with

7α-^{3}H-progesterone and the metabolites were extracted and chromatographed on thin layer silica gel. The acetone powder prepared from 800 mg fresh whole brain tissue was incubated with 1α,2α-^{3}H testosterone, and metabolites extracted and chromatographed. Plasma of treated animals contained decreased testosterone and increased estradiol levels. The brain of treated animals showed increased dihydrotestosterone and decreased androstenediol formation from testosterone. Adrenal glands from treated animals showed a decrease in both corticosterone formed from progesterone and unchanged progesterone. It is concluded that *p,p'*-DDT treatment results in a general decrease in androgen biosynthesis, a decrease in plasma estradiol level, and a decrease in 11β-hydroxylase activity (evident from the lower amount of corticosterone formed from progesterone in the adrenal tissue).

81-1446. Niemi, W. D.; Webb, G. D. (Dep. Physiol. & Biophys., Coll. Med., Univ. Vermont, Burlington, VT 05405) **DDT and sodium transport in the eel electroplaque.** *Pestic. Biochem. Physiol.* 14(2): 170-177; 1980 (45 references).

DDT and sodium transport were studied in eel electroplaque, a highly innervated cholinergic cell embryologically derived from muscle that contains very high concentrations of Na-K ATPase, acetylcholinesterase, acetylcholine receptors, and electrically excitable Na channels. Effects of DDT on the electrophysiological properties of the electroplaque, on rate of Na efflux from the electroplaque, and on ATPase activity of the intact electroplaque were determined. DDT inhibited 46% of the total ATPase activity at 10^{-5} *M* and 62% of the total ATPase activity at 10^{-4} *M*. A concentration of 10^{-4} *M* DDT also reduced the rate of Na efflux from intact electroplaques and slowed the rate of recovery of the membrane potential following a large depolarization produced by carbamylcholine application. A significant irreversible depolarization occurred following repetitive direct stimulation of the innervated membrane at 10 Hz during the application of 10^{-4} *M* DDT. A discussion is presented of the possible role of these effects in DDT toxicity.

81-1447. Dillwith, J. W.; Lewis, R. A. (Div. Biochem., Univ. Nevada, Reno, NV 89557) **Inhibition of DNA polymerase B activity in isolated bovine liver nuclei by captan and related compounds.** *Pestic. Biochem. Physiol.* 14(2): 208-216; 1980 (19 references).

Isolated bovine liver nuclei were used in studies which indicated the inhibition of DNA synthesis by the fungicide captan and structurally related compounds. Isolated nuclei and the test compounds were added to the incubation mixture, and incubated for up to 60 min. Effects on DNA synthesis were determined by measuring the incorporation of [^{3}H]dTTP into acid soluble material, and DNA polymerase activity was also determined. All compounds (captan, folpet, captafol, and trichloromethanesulfenyl chloride) inhibited DNA synthesis to the same extent. The trichloromethylthio moiety of the captan molecule was shown to mediate the inhibition of DNA synthesis by captan. Isolated nuclei exhibited only a single DNA polymerase activity, determined to be of the β (low molecular wt) type. Captan inhibited the activity of the β polymerase in intact nuclei, nuclear extracts, and partially purified enzyme preparations. It was concluded that in this system captan inhibits DNA synthetase by acting directly on the DNA polymerase-catalyzed reaction, and that the site of captan's inhibiting action is the DNA polymerase molecule.

81-1448. Crayford, J. V.; Hutson, D. H. (Sittingbourne Res. Cent., Shell Toxicol. Lab., Shell Res. Ltd., Sittingbourne, Kent ME9 8AG, England) **The metabolism of the herbicide flamprop-methyl in rats and some comparative data for dogs, mice and rabbits.** *Pestic. Sci.* 11(6): 573-590; 1980 (6 references).

[^{14}C]Flamprop- methyl administered orally to rats (3-4 mg/kg body wt) was excreted mostly via the feces (78.7 and 61.6% in males and females, respectively). Elimination was rapid and 90% of the dose of ^{14}C was excreted in feces and urine 0-48 hr after dosing. The distribution of ^{14}C between feces and urine was different in males and females. No expired [^{14}C]carbon dioxide was detected and < 2% of the dose remained in the animals 4 days after dosing. The predominant metabolic pathway was hydrolysis of the ester bond to afford the carboxylic acid which was excreted unchanged and as its glucuronide conjugate. Aromatic hydroxylation occurred at the *para*- and *meta*-positions of the *N*-benzoyl ring. *N*-(3-Chloro-4- fluorophenyl-*N*- (3,4-dihydroxybenzoyl) -DL-alaninate was also formed. This hydroxylated form of flamprop-methyl was partially *O*-methylated at the 3-hydroxy group. Flamprop-methyl was also metabolized and eliminated rapidly by dogs, mice and rabbits. The last of these 3 species afforded very little aromatic hydroxylation and also differed from the others in that the metabolites were eliminated mostly in the urine. Aromatic hydroxylation lay in the order: male rat = female rat > dog = mouse > rabbit (female). (Author abstract by permission)

81-1449. Priester, T. M.; Georghiou, G. P. (Div. Toxicol. & Physiol., Dep. Entomol., Univ. California, Riverside, CA 92521) **Cross-resistance spectrum in pyrethroid-resistant *Culex quinquefasciatus*.** *Pestic. Sci.* 11(6): 617-624; 1980 (29 references).

Strains of *Culex quinquefasciatus* Say, selected with biopermethrin [(1*R*)-*trans*- permethrin] or with (1*R*)-*cis*-permethrin, were examined in the larval stage for cross-resistance to 30 pyrethroids, DDT, dieldrin, temephos, propoxur, and 2 organotin compounds. The (1*R*)-*trans*-permethrin- R strain [resistance factor (RF) =

4100-fold] and the (1*R*)-*cis*-permethrin-R strain (RF = 450-fold) of *C. quinquefasciatus* were cross resistant to all pyrethroids tested [RF = 12-fold for an allethrin isomer to about 6000-fold for (*RS,RS*)-fenvalerate] as well as to DDT (RF = about 2000-fold). However, they were not significantly cross-resistant to dieldrin, temephos, propoxur, and the 2 organotin compounds. Changes in the alcohol moiety, structural isomerism, and susceptibility of the cyclopropane C-3 side chain to oxidative attack are important factors in determining the level of cross-resistance to various pyrethroids. Limited synergism of the pyrethroids by *S,S,S*-tributyl phosphorotrithioate and piperonyl butoxide (PB), and of DDT by chlorfenethol and PB, suggested that some non-metabolic mechanism, such as *kdr*, may be an important component of resistance to pyrethroids as well as to DDT in this mosquito. (Author abstract by permission)

81-1450. Nassif, M.; Brooke, J. P.; Hutchinson, D. B. A.; Kamel, O. M.; Savage, E. A. (Res. Inst. Med. Entomol., Cairo, Egypt) **Studies with permethrin against bodylice in Egypt.** *Pestic. Sci.* 11(6): 679-684; 1980 (4 references).

Approximately 350 people, the inhabitants of 2 villages in the Fayum district of Egypt, were individually dusted with 50 g of powder containing 2.5 or 5.0 g permethrin/kg. The inhabitants of a third village were left untreated as a control. Before treatment, approximately 66% of the population of all 3 villages were infested with bodylice. Fourteen days after treatment, the permethrin dust at the lower strength reduced the infestation by 98.8% and at the higher strength by 100%. The dust containing 5 g permethrin/kg maintained a high level of residual control (80.5%) for at least 91 days. The other gave a lower level of control at this time. Urine samples, taken from subjects in each of the treated villages before and after dusting, were analyzed for permethrin metabolites. Results indicated that the maximum amount of permethrin absorbed, orally, through the skin, or by inhalation, was 39 μg/kg body wt, 24 hr after treatment. No residue were found 30 days and 60 days after treatment. It was concluded that there was a very substantial safety margin when permethrin dusts were used on man for bodylice control. (Author abstract by permission)

81-1451. Varma, G. C.; Bindra, O. S. (Dep. Entomol., Punjab Agric. Univ., Ludhiana, India) **Studies on the chemical control of *Pyrilla perpusilla* (Walker) and effect of insecticides on its natural enemies.** *Pesticides* 14(6): 9-10; 1980 (1 reference).

Studies were designed to test the effectiveness of various insecticides against the sugarcane pest *Pyrilla perpusilla*, and to test the effect of the insecticide on 2 natural enemies of *Pyrilla*. Sugarcane plots were treated with malathion at 0.5 kg AI/ha, dimethoate, vamidothion, and endosulfan at 0.4 kg AI/ha. Three wide buffers of untreated sugarcane were maintained to conserve natural enemies. Nymphs and adults of *Pyrilla* were counted on randomly selected leaves. When adults of the natural enemy *Epipyrops melanoleuca* were examined for emergence from cocoons, no significant effect of any of the insecticides was seen. However, emergence of *Tetrastichus pyrillae* was considerably reduced by malathion and endosulfan. It was concluded that dimethoate was the best treatment, in view of its effective control of *P. perpusilla* and its safety to parasitoids.

81-1452. Siddaramaiah, A. L.; Kulkarni, S.; Hegde, R. K. (Dep. Plant Pathol., Coll. Agric., Dharwad 580005, India) **Effect of weedicides on the growth of *Streptomyces* sp.** *Pesticides* 14(6): 30-31; 1980 (3 references).

The possible effects of 3 herbicides used in groundnut growing areas on the growth of the soil actinomycete *Streptomyces* sp. were studied. *Streptomyces* is antagonistic to *Rhizotonia bataticola*, a predominant root parasite of groundnut crop. *Streptomyces* cultures were added to alachlor, TOK-E-25 (nitrofen) and Tillam (pebulate) solutions of 5, 10 and 15 ppm. Dry wt of *Streptomyces* was recorded at 5 days intervals from day 10 to day 25. All 3 herbicides stimulated growth of *Streptomyces*, which would in turn limit the growth of *R. bataticola* in the soil.

81-1453. Dawson, J. K. (Harbors Environ. Proj., Inst. & Mar Coastal Stud., Univ. South California, Los Angeles, CA) **Copepods (Arthropoda: Crustacea: Copepoda).** In: *Pollution Ecology of Estuarine Invertebrates*. Hart, C. W., Jr. and S. L. H. Fuller, eds. (Academic Press: NY): CH05: 145-170; 1979 (150 references).

Data related to the effects of various pollutants on holoplanktonic estuarine copopods found in the North American continent are summarized. Mercury was found to be 2- to 4-fold more toxic than copper at high concentrations, and about equal in toxicity at low concentrations (1-10 μg/l). Heavy metals are more concentrated in estuarine and coastal waters than offshore; few sensitivity differences between inshore and offshore copepods to heavy metals have been found. Several studies of the uptake of DDT by marine copepods exist. In one survival study no significant metabolism of DDT was observed over an 8 wk period. This lack of metabolism may be due to the external absorption of DDT rather than incorporation into the animals, or to the very low temperature at which the experiment was conducted (6°C). The bioconcentration of DDT from plankton to birds has been demonstrated. However, concentration of DDT from phytoplankton to zooplankton has not been proven.

81-1454. Couch, J. A. (Gulf Breeze Environ. Res., Lab., US EPA, Gulf Breeze, Fl 32561) **Shrimps (Arthropoda: Crustacea: Penaeidae).** In: *Pollution Ecology of Estuarine Invertebrates.* Hart, C. W., Jr. and S. L. H. Fuller, eds. (Academic Press: NY): CH07: 235-258; 1979 (64 references).

Information on the pollution ecology of penaeid shrimps is reviewed. Organic chemicals other than petroleum (including pesticides), petroleum, heavy metals (Cd, Cu, Hg) and biological agents, are considered. Interactions of pollutants, pollutant mixes and other factors in penaeid shrimp ecology are discussed. Shrimps have been found to accumulate certain pesticides in the laboratory. Feral shrimps have contained detectable levels when taken directly from contaminated or apparently clean waters. The effects of some well known pesticides, including the organochlorines dieldrin, endrin, heptachlor, hexachlorobenzene, lindane, mirex and toxaphene, are reviewed. Few organophosphates have been tested on crustaceans. However, results indicate that organophosphates possess a 1000-fold greater toxicity to shrimps than most other pesticides. Baytex (fenthion), naled, malathion and parathion have been found to be very toxic to shrimp in the laboratory. Carbaryl has also been shown to be toxic to shrimp in laboratory tests.

81-1455. Epifanio, C. E. (Coll. Mar. Stud., Univ. Delaware, Lewes, DE 19958) **Larval decapods (Arthropoda: Crustacea: Decapoda).** In: *Pollution Ecology of Estuarine Invertebrates.* Hart, C. W., Jr. and S. L. H. Fuller, eds. (Academic Press: NY): CH08: 259-292; 1979 (64 references).

The general biology, life cycle, and cultural techniques for larval Decapoda are presented. The effects of pollutants, including pesticides, petroleum hydrocarbons and miscellaneous pollutants, are considered. The effects of chlorinated hydrocarbon pesticides, including DDT, dieldrin, mirex and methoxychlor, on decapod larvae have been studied. The effects of other pesticides, including Sevin (carbaryl), fenitrothion, malathion, and the juvenile hormone mimics methoprene and hydroprene, have been studied less extensively. Generalizations drawn from these studies indicate that there is no one stage at which decapod larvae are most sensitive to pesticides. Different pesticide concentrations may yield increased mortality at various developmental stages. In the majority of the studies, zoeae are exposed to a given concentration from hatching to metamorphosis, and increased mortality in each stage is statistically verified. The possibility of selection for more resistant larvae as development progresses is not accounted for. An alternative technique involving mass culture of large numbers of larvae, and initial exposure at a given developmental stage, is suggested. However, large numbers of larvae are required. Chlorinated hydrocarbons and the carbamate Sevin are concluded to be the most toxic compounds tested. Acute toxicities with all organochlorines and Sevin were noted at 1.0-10.0 ppb. Malathion was somewhat less toxic; sublethal effects occurred at > 10.0 ppb, and acute toxicity began at 80.0 ppb. Juvenile hormone mimics were concluded to be the least toxic compounds tested.

81-1456. Menzel, W. (Dep. Oceanogr., Florida State Univ., Tallahassee, FL 32306) **Clams and snails (Mollusca: Pelecypoda (except oysters) and Gastropoda).** In: *Pollution Ecology of Estuarine Invertebrates.* Hart, C. W., Jr. and S. L. H. Fuller, eds. (Academic Press: NY): CH12: 371-396; 1979 (137 references).

The effects of pollution on clams and snails is considered. Types and sources of pollution considered are domestic sewage, industrial pollution, radiation pollution, petroleum pollution, physical alternations and pesticides. Pesticides are concentrated in mollusks in a manner similar to that of metals. In one study the mud snail accumulated 0.26 ppm and the hard clam 0.42 ppm of DDT in an area where DDT had been used. Mollusks in California were found to contain residues of DDT, dieldrin and endrin in concentrations of 10-3600 ppb. Mollusks can depurate pesticides after accumulation. Some pesticides are particularly toxic to the planktonic stages of mollusks. Sevin (carbaryl) and its first hydrolytic product were toxic to the young stages of the blue mussel *Mytilus edulis.* A laboratory study of the effect of nearly 50 pesticides of different types on the larvae of several bivalves found that toxicities varied. Generally eggs and newly fertilized eggs were less tolerant than the older larvae. The solvent was frequently a toxic substance, or acted synergistically with the pesticide. All pesticides had some effect, ranging from mortality in large quantities to inhibition of growth rates at lower concentrations.

81-1457. Leighty, E. G. (Battelle Columbus Lab., Columbus, OH 43201) **Decreased retention of fatty acid conjugated DDT metabolites in rats given injections of heparin, bile salts or lecithin.** *Res. Commun. Chem. Pathol. Pharmacol.* 31(1): 69-76; 1981 (9 references).

To determine whether the *in vivo* injection of heparin, bile salts or lecithin into rats previously given ^{14}C-DDT decreased its retention time as fatty acid conjugates by affecting its esterification or ester hydrolysis, male Sprague-Dawley rats were given daily ip injections of 200 mg/kg ^{14}C-DDT for 3 days. At 7 days after the first injection the rats were given daily iv injections of 200 units/kg sodium heparin, 50 units/kg various bile salts, or 50 mg/kg lecithin for 3 days. Animals were sacrificed 24 hr after the last injection, and livers and spleens were removed and lyophilized. Radioactivity was measured and the extracts were analyzed on silca gel G thin-layer chromtography plates. All 3 compounds decreased retention of ^{14}C-fatty acid conjugated metabolites of ^{14}C-DDT in the livers and spleens. Spleens were more susceptible to DDT-fatty acid conjugate depletion than livers. The mechanisms

by which heparin, bile salts and lecithin remove conjugated metabolites is not resolved. Over 90% of the radioactivity extracted from the organs was shown by chromatography to be palmitoyl-DDOH, a fatty acid conjugated DDT metabolite; the remainder was DDT. The primary mechanism by which DDT is ultimately retained in animals and possibly humans may be conjugation of DDT metabolites to fatty acids. Heparin, bile salts, or lecithin may be valuable as therapeutic clearing agents for removing retained DDT.

81-1458. Lorusso, D. J.; Miller, T. L. (Dep. Agric. Chem., Oregon State Univ., Corvallis, OR 97331) **Hexachlorophene- induced changes in erythrocyte membrane ATPase activity.** *Res. Commun. Chem. Pathol. Pharmacol.* 31(2): 205-216; 1981 (30 references).

The effects of hexachlorophene (HCP) on the ATPase activity of the erythrocyte membranes of humans were studied. Na^+,K^+,Mg^{2+}-ATPase and Mg^{2+}-ATPase were assayed in erythrocyte ghost preparations in the presence and absence of HCP. The $Na\pm,K^+,Mg^{2+}$-ATPase was greatly reduced in a dose dependent manner by HCP. At 0.17 μmol activity was reduced by 50%. Mg^{2+}-ATPase was stimulated at concentrations of < 0.15 μmol HCP; 50% stimulation occurred at 0.2 μmol HCP. Bovine serum albumin negated the effects of HCP.

81-1459. Bellinck, C.; Mayaudon, J. (Lab. Ecol. Microb., Univ. Louvain, B-1348 Louvain-la-Neuve, Belgium) **Influence du phenmediphame et derives sur la microflore et les activites biologiques et enzymatiques d'un sol frais. [Effect of phenmedipham and derivatives on microflora and biological and enzymatic activities of a fresh soil.]** *Rev. Ecol. Biol. Sol* 17(1): 1-6; 1980 (10 references) (French).

Phenmedipham and derivatives were applied to fresh soil at 10 ppm. The bacterial flora was not significantly effected. An increase in the number of actinomycetes and fungi was noted. Biological activity was increased slightly. Urease and cellulase activities were increased. Protease, invertase, β-glucosidase, acid and alkaline phosphatases, pyrophosphatase and ciphenoloxidase activities were unchanged.

81-1460. Urbanek-Karlowska, B. (Dep. Food Res. & Objective Use, State Inst. Hyg., PL-00791 Warsaw, Poland) **Aktywnosc wybranych enzymow jako wskaznik szkodliwego dzialania w toksykologii doswiadczalnej. [Activity of selective enzymes as an indicator of noxious influence in experimental toxicology.]** *Rocz. Panstw. Zakl. Hig.* 31(5): 453-456; 1980 (Polish).

Studies were undertaken to prepare a new toxicity model that emphasizes enzymatic determination, particularly in the liver, for evaluation of toxicity. Two fungicides, captan and maneb, were fed to rats during a 3 mo period in diets with varying protein content. Determinations were made of the activity of mitochondrial, microsomal and lysosomal enzymes, as well as enzymes present in the soluble fraction of hepatic cytoplasm. The relationships between enzyme activities and protein were examined. The affects of low protein diet on enzyme activity varied; increased, decreased and unchanged activities were observed. Liver changes increased with decreased protein levels. Maneb inhibited microsomal enzyme activity. It is concluded that studies of liver enzymes permit early detection of changes in cells and organelles, which precede indications of irreversible damage to organs and tissues. Changes in blood serum are less characteristic. Tests of liver enzyme activities are suggested to be more useful in experimental toxicology than those of blood serum.

81-1461. Sanderson, C. A.; Rogers, L. J. (Pharmacol. Dep., Monash Univ., Clayton, Victoria 3168, Australia) **2,4,5-Trichlorophenoxyacetic acid causes behavioral effects in chickens at environmentally relevant doses.** *Science* 211(4482): 593-595; 1981 (11 references).

Administration of the herbicide 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) to incubating chicken eggs alters behavior after hatching. Single doses, with no morphological effects, retard learning (lowest dose, 7 mg/kg body wt) and increase general activity (27 mg/kg) and jumping (13 mg/kg). Day 15 of incubation is the most susceptible stage of development. (Author abstract by permission. Copyright 1981 by the American Association for the Advancement of Science)

81-1462. Eisenbeis, S. J.; Lynch, D. L.; Hampel, A. E. (Dep. Biol. Sci. & Chem., North. Illinois Univ., DeKalb, IL 60115) **The Ames mutagen assay tested against herbicides and herbicide combinations.** *Soil Sci.* 131(1): 44-47; 1981 (14 references).

A group of 20 herbicides and 36 herbicide combinations were tested for mutagenic activity using the Ames *Salmonella*/mammalian microsomes assay. The herbicides tested included atrazine, chloramben, dicamba, cyanazine, dinitramine, naptalam, chlorpropham, alachlor, linuron, bifenox, paraquat, dinoseb, simazine, penoxalin, propachlor, metribuzin, oryzalin, butylate, trifuluralin, and vernolate. Tester strains used were TA 1535, 1537, 1538, 98 and 100, with and without S-9. No increases over background findings was noted for any of the herbicides or combinations tested, both at full strength or as dilute solutions.

81-1463. Smith, I. H.; Casida, J. E. (Pestic. Chem. & Toxicol. Lab., Dep. Entomol. Sci., Univ. California,

Berkeley, CA 94720) **Epoxychrysanthemic acid as an intermediate in metabolic decarboxylation of chrysanthemate insecticides.** *Tetrahedron Lett.* 22(3): 203-206; 1981 (20 references).

Studies were designed to elucidate the metabolism of the pyrethrins and several pyrethroids, which are potent insecticides derived from chrysanthemic acid. They undergo rapid metabolism in insects and mammals by processes that include ester hydrolysis and methyl, methylene, allyl and aryl oxidation. After oral administration of (^{14}C=O)pyrethroids to rats and mice, expired $^{14}CO_2$ accounts for 0.3-3.1% of the dose. Various reactions were carried out to determine the possible role of epoxychrysanthemates in $^{14}CO_2$ production. It was determined that sequential enzymatic isobutyl epoxidation, hydrolysis of the epoxychrysanthemate, and a nonenzymatic concerted decarboxylation and oxirane-ring opening reaction are involved in the metabolic decarboxylation of tetramethrin and related chrysanthemate insecticides.

81-1464. Misawa, M.; Doull, J.; Kitos, P. A.; Uyeki, E. M.* (Dep. Pharmacol., Med. Cent., Univ. Kansas, Kansas City, KS 66103) **Teratogenic effects of cholinergic insecticides in chick embryos. I. Diazinon treatment on acetylcholinesterase and choline acetyltransferase activities.** *Toxicol. Appl. Pharmacol.* 57(1): 20-29; 1981 (36 references).

Teratogenic effects of diazinon were assessed morphologically and correlated with values determined by radiometric determinations for acetylcholinesterase (AChE) and choline acetyltransferase (ChAT) activities. Diazinon, at doses ranging from 23 to 1854 μg/chick egg, was injected on day 3 of incubation, and enzyme activities in hindlimb, wing, and brain were measured on days 6-20 of incubation. Generally, these organs displayed similar patterns of enzyme alteration. With an injected dose of 200 μg diazinon/egg, AChE activity was inhibited about 90% at days 6-8, about 50% at day 10, and not at all at day 13. ChAT activity was not significantly different between diazinon- and corn oil-injected embryos. The threshold dose for type II teratogenic signs (such as wry neck and short neck) was higher than for type I signs (such as micromelia and abnormal feathering). Morphological studies, using atropine and gallamine, suggested that nicotinic but not muscarinic receptors may be involved in the mechanism of diazinon-induced type II malformations. Nicotinamide, which prevented type I malformations, did not prevent the diazinon-induced AChE inhibition. From the above findings, it is confirmed that the cholinergic dysfunction does not temporally correlate with the type I teratogenic effects. (Author abstract by permission)

81-1465. Roth, R. A. (Dep. Pharmacol. & Toxicol., Cent. Environ. Toxicol., Michigan State Univ., East Lansing, MI 48824) **Effect of pneumotoxicants on lactate dehydrogenase activity in airways of rats.** *Toxicol. Appl. Pharmacol.* 57(1): 69-78; 1981 (25 references).

To assess the usefulness of monitoring changes in lactate dehydrogenase (LDH) activity in the cell-free fraction of bronchopulmonary lavage fluid as an indicator of pulmonary injury, several toxicants were administered to rats using treatment regimens which have been shown previously to result in histopathologically demonstrable pneumotoxicity. For all of the toxicants employed, except exposure to 1 atm O_2, treatment did not affect recovery of lavage fluid from the lung. Lavage fluid LDH activity was elevated following treatment with paraquat, bromobenzene, and oxygen. Administration of monocrotaline using a treatment regimen which results predominantly in lung injury also produced elevated LDH activity in lavage fluid; however, treatment with this same compound using a regimen which results predominantly in hepatic injury failed to elevate lavage fluid LDH activity but resulted in a more pronounced increase in LDH activity in plasma. Similarly, the hepatotoxicant, carbon tetrachloride, produced a marked increase in plasma LDH activity without affecting that of the lavage fluid. The sensitivity of this method in detecting increased LDH activity was minimally dependent upon the volume of fluid used for lavage or on the number of successive lavages used for analysis. It appears to be useful as a rapid screening test for detecting lung injury from chemicals which are pneumotoxic following inhalation or systemic administration. (Author abstract by permission)

81-1466. Glickman, A. H.; Hamid, A. A. R.; Rickert, D. E.; Lech, J. J. (Dep. Pharmacol. & Toxicol., Med. Coll. Wisconsin, Milwaukee, WI 53226) **Elimination and metabolism of permethrin isomers in rainbow trout.** *Toxicol. Appl. Pharmacol.* 57(1): 88-98; 1981 (15 references).

Although permethrin, a synthetic pyrethroid insecticide, is highly toxic to fish, its toxicity to mammals is comparatively low. The distribution and metabolism of the *cis*- and *trans*-permethrin isomers were studied in rainbow trout to evaluate the role of these parameters in the differential toxicity of permethrin to fish and mammals. Both [^{14}C]permethrin geometrical isomers were readily taken up and eliminated by rainbow trout. Elimination half-lives for [^{14}C]permethrin residues in trout tissues, with the exception of fat, were in the magnitude of hours. High concentrations of a polar metabolite were found in bile within 4 hr of *cis*- and *trans*-permethrin exposure. Analysis by β-glucuronidase treatment, analytical thin layer chromatography, and gas chromatography-mass spectroscopy indicated that the metabolite was the glucuronide conjugate of 4′-HO-permethrin. Urine contained a small amount of a polar metabolite that was resistant to hydrolysis by β-glucuronidase but was cleaved to some extent by aryl sulfatase. The relative absence of permethrin hydrolysis products in trout bile and the small amount of radioactivity excreted in urine suggested that the ability of rainbow trout to hydrolyze permethrin, *in vivo*, was minimal. (Author abstract by permission)

81-1467. Hawksworth, G. M.; Bennett, P. N. (Dep. Pharmacol., Univ. Aberdeen, Aberdeen AB9 2ZD, Scotland) **Kinetics of paraquat elimination in the dog.** *Toxicol. Appl. Pharmacol.* 57(2): 139-145; 1981 (14 references).

The elimination and distribution kinetics of paraquat and the effect of paraquat-induced renal damage on these parameters have been studied in the dog. After iv administration, low doses (30-50 μg/kg) of paraquat were rapidly excreted in the urine at a clearance rate in excess of the glomerular filtration rate, indicating that paraquat was eliminated by active secretion. This secretion could be inhibited by competition with *N'*-methylnicotinamide, a quaternary ammonium compound. Large doses (20 mg/kg) of paraquat induced renal failure; the extent of renal function impairment depended upon the dose. The plasma concentration-time curve showed a triexponential decline, so that the elimination of paraquat could be described by a 3 compartment open model. Simulation of paraquat levels in the peripheral compartments indicated that, with early renal failure, 5-fold higher levels would be achieved in the slow uptake compartment than under conditions of normal renal function. Since the energy-dependent accumulation of paraquat by the lung is a slow process, it was assumed that the slow uptake compartment included the lung. The implications of this are discussed in relation to the rational treatment of paraquat poisoning in man. (Author abstract by permission)

81-1468. Cantoni, L.; Salmona, M.; Rizzardini, M. (Lab. Enzyme Res., Ist. Ric. Farmacol. Mario Negri, I-20157 Milan, Italy) **Porphyrogenic effect of chronic treatment with 2,3,7,8-tetrachlorodibenzo- *p*-dioxin in female rats. Dose-effect relationship following urinary excretion of porphyrins.** *Toxicol. Appl. Pharmacol.* 57(2): 156-163; 1981 (28 references).

The porphyrogenic effect of 2,3,7,8-tetrachlorodibenzo- *p*-dioxin (TCDD) was evaluated in female rats treated chronically for 45 wk with 0.01, 0.10, and 1.00 μg/kg TCDD/wk. The time course of the urinary porphyrin pattern was followed in order to determine the qualitative and quantitative composition in urine and to test the sensitivity of a parameter such as porphyrins in urine as an indication of exposure to TCDD. The results showed that the dose of 0.01 μg/kg/wk resulted in significantly enhanced excretion of coproporphyrin from 6 mo onward; with the dose of 0.10 μg/kg/wk coproporphyrinuria was observed after 3 mo and was associated at 10 mo with a significant rise in uroporphyrin. The highest dose (1.00 μg/kg/wk) caused enhanced excretion of coproporphyrin from 2 mo onward. This effect was associated, at 6 mo, with an increase in hepatocarboxylic porphyrin and uroporphyrin excretion. A marked porphyric state was established in this group of animals from 8 mo onward as indicated by massive enhancement of total urinary porphyrin excretion (about 70 times higher than the control group) with a large prevalence of porphyrins with a high number of carboxyl groups and reversal of the coproporphyrin/uroporphyrin ratio. Accumulation of porphyrins was also observed in liver, spleen, and kidneys of this group of animals. Terminal livers of rats treated with 0.01, 0.10, and 1.00 μg/kg/wk contained 1050, 4740, and 30,700 ppt, respectively. Comparison of the data with the literature on the porphyrogenic effect of hexachlorobenzene indicated that TCDD can be considered 1400 times more potent. (Author abstract by permission)

81-1469. Birnbaum, L. S.; Decad, G. M.; Matthews, H. B.; McConnell, E. E. (Natl. Toxicol. Program, NIEHS, Research Triangle Park, NC 27709) **Fate of 2,3,7,8-tetrachlorodibenzofuran in the monkey.** *Toxicol. Appl. Pharmacol.* 57(2): 189-196; 1981 (16 references).

The fate of [^{14}C]tetrachlorodibenzofuran (TCDF) was studied in male Rhesus monkeys *(Macaca mulatta)* after a single iv treatment. Excretion was followed for 21 days post-treatment, and terminal distribution and toxicopathologic studies were performed. After 3 wk, less than 10% of the total dose of 30.7 μg/kg remained in the body. Both urine and feces served as routes of excretion, with approximately 4 times more radioactivity being excreted via the fecal than the urinary route. The fat, skin, and liver were the major depots for the [^{14}C]TCDF remaining in the body at 21 days. With the exception of traces of TCDF metabolites in the blood at 21 days, the radioactivity present in the body was parent compound, while radioactivity excreted from the body was in the form of metabolites of [^{14}C]TCDF. Gross morphological alterations were noted in the eyelids of the monkeys at the time of sacrifice. Histopathological changes were detected in the Meibomian glands of the eyelid, the ceruminous glands of the external auditory canal, and in the epithelium of the stomach. Thus, although the disposition of TCDF in monkeys is similar to that previously reported for rats, monkeys clear TCDF from the body more slowly than do rats and are apparently more sensitive to TCDF intoxication. (Author abstract by permission)

81-1470. Decad, G. M.; Birnbaum, L. S.; Matthews, H. B. (Environ. Biol. Branch, NIEHS, Research Triangle Park, NC 27709) **2,3,7,8-Tetrachlorodibenzofuran tissue distribution and excretion in guinea pigs.** *Toxicol. Appl. Pharmacol.* 57(2): 231-240; 1981 (18 references).

The tissue distribution and excretion of [^{14}C]2,3,7,8-tetrachlorodibenzofuran (TCDF) in adult male guinea pigs was studied up to 9 days following an iv or po administration (6.0 μg/kg, 0.02 μmol/kg). Greater than 90% of the dose was absorbed after po administration. Tissue concentrations and excreta were examined for [^{14}C]TCDF-derived material for periods ranging from 1 hr to 9 days after administration. Liver, muscle, skin, and adipose tissue were found to be the most important tissues for the distribution of this compound. The highest levels of

radioactivity were initially located in the liver and muscle, and then redistributed to the skin and adipose tissue. At 1 day the radioactivity began to be redistributed back to the liver; this second redistribution appeared to be due to the mobilization of fat stores associated with the overt toxicity of TCDF. At all time points, the specific activity of TCDF-derived radioactivity (% dose/g tissue) was highest in liver, fat, and adrenals, respectively. The initial phase for the elimination of radioactivity from the liver and muscle had a half-life of 3.9 and 15.7 hr, respectively. Excretion in urine and feces each accounted for only 6.6 and 6.5% of the dose, respectively, during the 9 days following administration. Greater than 90% of the extracted radioactivity in feces and tissues examined cochromatographed with parent TCDF. However, the radioactivity in the urine did not chromatograph with TCDF and appeared to be a metabolite(s) more polar than TCDF. Studies of the accumulation and distribution of TCDF-derived material after 6 or more weekly doses of 1 μg/kg TCDF each demonstrated that TCDF is accumulated in the liver, adipose tissue, and skin, and that when a body burden of approximately 5.6 to 6.6 μg/kg was attained, the toxicity of this compound was irreversible and resulted in progressive wt loss and death. (Author abstract by permission)

81-1471. Nachtomi, E. (Inst. Anim. Sci., Agric. Res. Organ., Volcani Cent., Bet Dagen, Israel) **Role of diethyldithiocarbamate in ethylene dibromide metabolism and covalent binding.** *Toxicol. Appl. Pharmacol.* 57(2): 247-253; 1981 (36 references).

Diethyldithiocarbamate (DDC) pretreatment of rats prevented the ethylene dibromide (EDB) depression of liver glutathione (GSH) 2 hr after intoxication. The levels of cytochrome P-450 seem to be unaffected by EDB. The steady-state kinetics of the reaction of GSH with [U-^{14}C]EDB *in vitro*, in the presence of glutathione-*S*-transferase, was determined by GSH utilization and the formation of a labeled nonvolatile product. The inhibition of the enzyme by DDC is noncompetitive producing a change in V_{max} without a change in K_m. DDC also inhibited the covalent binding of [^{14}C]EDB to microsomal proteins in the microsomal system supplemented with NADPH. EDB bound to microsomal protein in the absence of NADPH. The role of DDC in the metabolism and covalent binding of EDB to macromolecules is discussed. (Author abstract by permission)

81-1472. Lam, H. F.; Takezawa, J.; Gupta, B. N.; Van Stee, E. W. (NIEHS, Research Triangle Park, NC 27709) **A comparison of the effects of paraquat and diquat on lung compliance, lung volumes and single breath diffusing capacity in the rat.** *Toxicology* 18(2): 111-123; 1980 (26 references).

Adult male Sprague-Dawley rats were used in studies designed to measure the changes in lung function resulting from paraquat and diquat treatment. Animals were treated with 13.5 or 27 mg paraquat/kg ip, 0.5 mg paraquat/kg i.t., 27 mg diquat/kg ip, and 0.5 mg diquat/kg i.t. Lung volumes, single breath diffusing capacity of the lungs for carbon monoxide (DLCO), and static lung compliance [CSt(L)] were measured 12, 24, 48, and 72 hr after treatment. Diquat ip decreased body wt and caused a slight decrease in vital capacity, but generally had little effect on the lungs. In contrast, 0.5 mg/kg paraquat i.t. and 27 mg/kg paraquat ip decreased body wt, total lung capacity, functional residual capacity, vital capacity residual volume, DLCO, apparent alveolar volume, and CST(L). The 13.5 mg/kg ip dose of paraquat significantly decreased vital capacity and total lung capacity. These findings are consistent with the known effects of paraquat, which include severe lung damage associated with decreased elastically of the lungs and thorax, destruction of gas exchangeing alveolar surfaces, and edema.

81-1473. Saxena, A. K.; Sarin, K. (Dep. Zool., Univ. Rajasthan, Jaipur 302004, India) **Histopathological and biochemical changes in the liver and testes of desert gerbil, after repeated exposures to Thimet (phorate).** *Toxicology* 18(2): 133-144; 1980 (22 references).

The effects of Thimet (phorate) on the liver and testes of gerbils were tested. Wild-caught adult gerbils were acclimated for 1 wk, then injected with 0.6 mg Thimet/kg in olive oil 3 times/wk for 30 days. Controls received only olive oil. Animals from the experimental and the control groups were sacrificed on days 7, 15, and 30 of treatment. Some animals were kept for a recovery period of 15 days after the injections ceased, and then sacrificed. Histopathological and biochemical assays were performed. Livers showed enlarged hepatocytes and mild cytoplasmic degeneration after 7 days, and fatty degenerative changes (karyorrhexis and karyolysis) after 30 days. After treatment ceased, partial recovery of the organ occurred. Testes of experimental animals showed abnormal seminiferous tubules after 7 days. By 30 days of exposure, degenerative changes included enlarged interstitium with active and enlarged atrophied Leydig cells, reduced seminiferous tubules, and desquamated spermatogenic cells. Recovery occurred within 15 days after the treatment had ceased. Liver alkaline and acid phosphatase increased, while glucose 6-phosphatase and ATPase decreased. In the testes, alkaline phosphatase, acid phosphatase, and glucose-6-phosphatase increased and ATPase decreased. Enzymatic activity partially returned to normal after cessation of treatment.

81-1474. Bridges, J. W. (Robens Inst. Ind. & Environ. Health, & Saf., Univ. Surrey, Guildford, Surrey GU2 5XH, England) **Monooxygenase reactions glucuronic acid and sulphate conjugation in isolated hepatocytes.** *Toxicology* 18(3): 195-204; 1980 (25 references).

A review is presented of the use of isolated hepatocytes in drug metabolism studies. Topics include passage across the plasma membrane and metabolism by cytochrome P-450. The role of substrate lipophilicity is considered. Excretion of metabolites and the relationship between Phase 1 and Phase 2 metabolism are also described. Studies using biphenyl as a substrate show that addition of classical metabolic inhibitors such as rotenone or 2,4-dinitrophenol dramatically modify the ratio of free phenol to its conjugates. 2,4-Dinitrophenol (2×10^{-4} *M*) increased the total amount of 4-hydroxybiphenyl formed compared with the control, while decreasing the total amounts of glucuronic acid and sulfate conjugates. Other topics discussed include the effects of cofactor levels and external factors on drug metabolizing activity, and tissue and species comparisons of drug metabolizing activities.

81-1475. Pilinskaya, M. A.; Kurinnyi, A. I.; L'vova, T. S.; German, I. V. (All-Union Res. Inst. Hyg. Toxicol. Pestic. Polym. & Plast., Kiev, USSR) **Pervichnaya otsenka tsitogeneticheskoi aktivnosti i potentsial'noi mutagennoi opasnosti 22 pestitsidov. [Primary evaluation of cytogenetic activity and potential mutagenicity of 22 pesticides.]** *Tsitol. Genet.* 14(6): 41-45; 1980 (12 references) (Russian).

The cytogenetic and mutagenic activity of 22 pesticides from 8 classes of chemical compounds were studied in random-bred albino mice. Animals were subjected to a single ig administration of pesticide at 0.2-0.5 LD50. The frequency of aberrant metaphases was used as a criterion for the primary screening. Of the 22 pesticides tested, 9 [Betanal (phenmedipham), Alipur (chlorobufam + cycluron), Prefix (chlorthiamid), Propanid (propanil), Ramrod (propachlor), Sutan (butylate), Vernam (vernolate) and Pirimor (pirimicarb)] were found to significantly increase the frequency of chromosome aberrations.

81-1476. Hall, R. J. (US Fish & Wildl. Serv., Patuxent Wildl. Res. Cent., Laurel, MD 20811) **Effects of environmental contaminants on reptiles: a review.** *US Fish Wildl. Serv. Spec. Sci. Rep. Wildl.* 228: 12 pp.; 1980 (68 references).

Literature on the effects of environmental contaminants, particularly pesticides, on reptiles, is reviewed. Such information is fragmentary; this review is intended to summarize the data to allow future work to be more responsive to the remaining questions. Most reptiles killed by pesticides have been nontarget organisms receiving direct exposure to pesticides or secondary poisoning resulting from the consumption of contaminated prey. The data available on the observed effects of pesticide usage on reptiles are summarized in tabular form; data on DDT, dieldrin, heptachlor, endrin, BHC, Vapona (dichlorvos), phosphamidon, Bidrin (dicrotophos), toxaphene and fluoroacetamide is included. Residues of environmental contaminants reported in dead and surviving reptiles are also presented in tabular form. Studies on distribution of residues in reptilian tissues, uptake and loss rates, physiological effects, and sublethal effects are described. Suggestions for future research include behavioral and reproductive studies, determination of sublethal effects which may have great consequences in nature, and examination of the possible contribution of pollutants to the status of endangered species.

81-1477. Shtenberg, A. I.; Zaeva, G. N.; Rysina, T. Z.; Krinitskaya, N. A.; Bogatykh, T. A.; Safronova, A. M. (Inst. Nutr., Moscow, USSR) **Issledovanie sostoianiya embriogeneza i potomstva krys pri vozdeistvii postoronnikh veshchestv, soderzhashchikhsya v pishche. [Analysis of the embryogenesis and progeny of rats exposed to xenobiotics contained in food products.]** *Vopr. Pitan.* (6): 51-55; 1980 (8 references) (Russian).

The results of experiments on the evaluation of embryotoxicity of various xenobiotics (pesticides and heavy metals) contained in food products are reviewed. The most pronounced teratogenic effect of γ-HCCH (α-BHC; lindane) was recorded after administration throughout gestation. Benlate (benomyl) induced the most pronounced disturbances of embryogenesis after administration from day 7 to day 15 of gestation. Xenobiotics altered the activity of a number of key enzymes and the level of SH-groups in a mother-fetus system. Developmental anomalies induced by Sevin (carbaryl) were found to increase in successive generations; the lethality within the mo 1 of the neonatal period increased from 4% in generation 3, to 10% in generation 4, and 18% in generation 5.

81-1478. Christy, S. L.; Karlander, E. P.; Parochetti, J. V. (Dep. Bot., Univ. Maryland, College Park, MD 20742) **Effects of glyphosate on the growth rate of *Chlorella*.** *Weed Sci.* 29(1): 5-7; 1981 (17 references).

The unicellular green alga, *Chlorella sorokiniana* Shihira and Krauss, was cultured *in vitro* using an inorganic growth medium with various concentrations of the herbicide glyphosate [*N*-(phosphonomethyl) glycine]. Growth rates, in terms of cell doublings/day, were determined for cells inoculated into media containing from 5.91×10^{-6} *M* to 591×10^{-6} *M* glyphosate. Comparisons with a control, which supported 10.4 doublings/day, showed growth only slightly reduced at 5.91×10^{-6} *M*, with averages of 9.7 and 9.5 doublings/day; reduced by more than half at 17.7×10^{-6} *M* with an average of 4.4 doublings/day; and prevented at all higher concentrations. In addition to completely preventing growth at 23.7×10^{-6} *M* and above, glyphosate seemed to cause a deterioration of the inoculum cells. Filtering the media containing 5.91×10^{-6} *M*, 11.8 ×

10^{-6} *M*, and 17.7×10^{-6} *M* through kaolinite prior to introduction of the alga reduced the inhibition previously noted at 17.7×10^{-6} *M* and resulted in growth rates from 9.1 to 9.5 doublings/day. (Author abstract by permission)

See also 81-1201, 81-1202, 81-1203, 81-1204, 81-1208, 81-1209, 81-1210, 81-1211, 81-1212, 81-1213, 81-1215, 81-1216, 81-1217, 81-1220, 81-1221, 81-1222, 81-1224, 81-1225, 81-1226, 81-1243, 81-1244, 81-1245, 81-1246, 81-1247, 81-1248, 81-1249, 81-1250, 81-1251, 81-1252, 81-1253, 81-1257, 81-1258, 81-1259, 81-1261, 81-1262, 81-1263, 81-1265, 81-1266, 81-1267, 81-1268, 81-1269, 81-1270, 81-1271, 81-1272, 81-1273, 81-1277, 81-1278, 81-1280, 81-1282, 81-1283, 81-1287, 81-1288, 81-1289, 81-1292, 81-1293, 81-1294, 81-1301, 81-1304, 81-1308, 81-1316, 81-1319, 81-1322, 81-1323, 81-1325, 81-1326, 81-1328, 81-1329, 81-1331, 81-1332, 81-1335 *and* 81-1336.

81-1479. Lasker, J. M.; Sivarajah, L.; Eling, T. E.; Abou-Donia, M. B.* (Dep. Pharmacol., Med. Cent., Duke Univ., Durham, NC 27710) **High-pressure liquid chromatography of neurotoxic phenylphosphonothioate esters and related compounds.** *Anal. Biochem.* 109(2): 369-375; 1980 (26 references).

A method for the analysis of phenylphosphonothioate esters and some possible degradation products using reverse-phase high-pressure liquid chromatography is presented. The method offers a rapid and accurate analysis of these compounds in metabolic studies. Leptophos, desbromoleptophos, EPN, cyanofenphos and EPBP were separated on a microparticulate RP-8 column using a gradient of 1-95% menthol in water for 30 min, following a 10-min isocratic delay. Ultraviolet absorbance at 280 nm was used for quantification. The relationship between peak area and amount injected was linear over at least a 100-fold range from the parent compounds, as well as their oxygen analogs and phenolic products. Ultraviolet detection limits were ~ 0.01 μg for EPN and related compounds and ~ 0.1 μg for leptophos, cyanofenphos, EPBP and related products.

81-1480. Lee, H. S.; Field, L. R.*; Howland, W. N.; Trager, W. F. (Dep. Chem., Univ. Washington, Seattle, WA 98195) **High-performance liquid chromatographic separation and fluorescence detection of warfarin and its metabolites by postcolumn acid/base manipulation.** *Anal. Chem.* 53(3): 467-471; 1981 (20 references).

A high-performance liquid chromatographic (HPLC) method for the fluorometric determination of warfarin and its metabolites (diastereomeric warfarin alcohols, and 4′-, 6-, 7- and 8-hydroxywarfarin) has been developed. The detection scheme utilizes a postcolumn acid-base fluorescence enhancement technique that provides high chromatographic specificity and sensitivity and is applicable to both human plasma and urine samples. Detection limits are in the low ng range. (Author abstract reprinted by permission of the American Chemical Society)

81-1481. Puchwein, G. (Landwirtsch. Chem, Bundesversuchsanstalt Linz, A-4025 Linz, Austria) **Concentration of dilute pesticide solutions.** *Anal. Chem.* 53(3): 544-546; 1981 (6 references).

Commercially available parts and glass tubes were used to construct an apparatus for the concentration of dilute pesticide solutions. The apparatus was assembled, and tests of its efficiency were made using pesticide solutions containing hexachlorobenzene; hexachlorobenzene + α-BHC, lindane, heptachlor + aldrin, β-BHC, α-chlordane, γ-chlordane, β-heptachlor epoxide, dieldrin, *p,p′*-DDE, endrin + *p,p′*-TDE; *o,p′*-DDT and *p,p′*-DDT. The time required for concentrating 4 ml was about 20 min. Either petroleum ether or hexane was used as solvent. Recoveries of different pesticides from mixtures were 93.2-96.2%. The device allowed concentration to occur under very mild conditions. A temperature of only about 5°C above the boiling point of the solvent was sufficient for the heating block. The nitrogen flow created an inert atmosphere. It is suggested that this device may be used whenever dilute solutions containing labile or volatile compounds must be reduced to a small volume.

81-1482. Miellet, A. (Lab. Agron. SICARGO, F-45160 Olivet, France) **Etude de differents systemes de purification pour les dosages de residus de pesticides dans les sols et vegetaux par CLHP. [Study of different purification systems to analyze pesticide residues in soils and plants by high performance liquid chromatography.]** *Ann. Falsif. Expert. Chim.* 73(791): 635-640; 1980 (14 references) (French).

Individual procedural HPLC steps are discussed pertaining to extraction, purification, and reading and interpretation of peaks. Acetone is recommended for soil extraction because it mixes with water, and thus enables the extraction of humid soils. Acetone is also used in extracting plant tissues. Vegetables with a high water content should be dried with sodium sulfate before purification. The absorbent Extrelut, a chemically treated diatomaceous earth which tolerates water, gave satisfactory results when 20% activated carbon and an equal amount of Celite-545 are arranged in an enclosed column filled with 1 g anhydrous sodium sulfate, 4 g of a Celite-activated carbon mix, 4 g of an Extrelut-activated carbon mix, and 1-2 g anhydrous sodium sulfate. A peak does not necessarily refer to a pesticide residue, and qualitative identification by TLC is recommended to avoid errors.

81-1483. Nagase, H.; Ose, Y.; Sato, T.; Ishikawa, T.; Mitani, K. (Dep. Environ. Hyg., Gifu Coll. Pharm., Gifu 502, Japan) **Differential determination of alkylmercury and inorganic mercury in river sediment.** *Int. J. Environ. Anal. Chem.* 7(4): 261-271; 1980 (5 references).

The use of steam distillation for differentiation of inorganic mercury and alkylmercury connected to mercury measurement by flameless atomic absorption spectrometry was investigated for mercury contamination measurements in river sediments. The effects of clay, humic acid, and sulfides on the outcome of these determinations were investigated. Methylmercury was recovered from clay soils. Recovery rates in soils containing humic acid were always over 80%. When sulfides were present, sulfur content over 1 mg caused the rate of recovery of mercury to decrease.

81-1484. Krzymien, M. (Unsteady Aerodyn. Lab., Natl. Aeronaut. Establ., Natl. Res. Counc. Canada, Ottawa, Ontario K1A OR6, Canada) **Sample collection and field analysis of tris-(2-ethylhexyl) phosphate used in a study of**

pesticide spray drift. *J. Chromatogr.* 204: 453-459; 1981 (7 references).

Tris-(2-ethylhexyl) phosphate (TEHP) is used as a non-toxic simulant for study of the long-range drift of airborne pesticides from aerial spray operations. An analytical procedure similar to that used for the determination of fenitrothion in ambient air is presented; however, several important changes in the GC and sampling procedures were made. TEHP vapor and aerosol were collected in glass adsorber tubes packed with a plug of fine platinum mesh coated with OV-101 and subsequently thermally released into a gas chromatograph for analysis. The capacity of the adsorber was determined to be *ca.* 700 *l* of air. Concentrations of pg/l were determined with a precision of better than ± 10%. The aerosol concentration and its drop-size distribution were determined at a pg level with ± 5% precision using a cascade impactor. (Author abstract by permission, modified)

81-1485. Sackmuerova-Veningerova, M.; Uhnak, J.; Szokolay, A.; Kocan, A. (Res. Inst. Prev. Med., CS-80958 Bratislava, Czechoslovakia) **Identification of chlorinated phenols as degradation products of chlorinated pesticides in biological materials.** *J. Chromatogr.* 205(1): 194-198; 1981 (20 references).

The identification and determination of chlorinated phenols in poultry liver and meat contaminated with HCH (BHC) and HCB (hexachlorobenzene) residues from feed were carried out by GC with an electron-capture detector, by thin-layer chromatography, and by a combination of GC with mass spectrometry directly or after derivatization with methyl iodide. The method was tested on samples of poultry liver and meat from laying hens in an HCB feeding experiment. Chlorinated phenols were determined as degradation products after thermal treatment. The presence of 2,4-DCP, 2,4,6-TCP and PCP was established. It is noted that the methylation of chlorinated phenols with methyl iodide was suitable for quantitative purposes, and can replace the carcinogen diazomethane. In GC the excess of methyl iodide did not interfere as its elution time corresponded with that of the solvent. The yield of the chlorinated phenols was in the range of 92-98%. The sensitivity of the GC method was 1×10^{-2} μg/g and of TLC 0.5-5 μg/g.

81-1486. Matisova, E.; Krupcik, J. (Chem. Fac., Dep. Anal. Chem., Slovak Tech. Univ., CS-88037 Bratislava, Czechoslovakia) **Separation of multi-component mixtures of N-dealkylated degradation products of s-triazine herbicides and their parent compounds by glass capillary gas-liquid chromatography.** *J. Chromatogr.* 205(2): 464-469; 1981 (15 references).

The use of capillary columns has been extended to separate mixtures of N-dealkylated s-triazines and their parent compounds. Twenty-nine s-triazines and their N-dealkylated degradation products were separated on a Carbowax 20M glass capillary column at 473°K. The chemicals in the mixtures include ipazine, prometron, terbutylazine, secbumeton, simeton, atrazine, prometryne, terbutryn, simazine, ametryn, desmetryn and simetryn. In analyzing a mixture of s-triazines and N-dealkylated degradation products with the same substituent in the 2-position, the undegraded substances always eluted first. The order of elution of both parent and degraded substances demonstrated shorter elution times for long or extensively branched alkyl chains bound to the amino group in the 4- or 6-position on the triazine ring. This effect is connected with shielding of the amino group by alkyl chains.

81-1487. Braumann, T.; Grimme, L. H. (Univ. Bremen, Fachber. Biol. Chem., D-2800 Bremen 33, BRD) **Determination of hydrophobic parameters for pyridazinone herbicides by liquid-liquid partition and reversed-phase high-performance liquid chromatography.** *J. Chromatogr.* 206(1): 7-15; 1981 (20 references).

The retention behavior of 8 herbicidal pyridazinones [SAN 6706, SAN 9789 (norflurazon), SAN 9774, SAN 9785, SAN 133-410 H, BAS 44521, BAS 33650, and BAS 13033 (pyrazon; chloridazon)] in a reversed-phase high-performance liquid chromatographic (RP-HPLC) system has been examined. Using methanol-water as the mobile phase, a linear relationship between the volume fraction of the organic modifier and the logarithm of the capacity factor (log k) over a limited range was established for every solute. A comparison of the resulting curves showed that the separation system is selective with respect to the lipophilic trifluoromethyl substituent with otherwise the same structure. The influence of such a selective effect on the correlation between log k' and the partition coefficient, P, obtained using the standard *n*-octanol-water system, is demonstrated. This effect can be eliminated if log P is related to the extrapolated k' value with pure water as eluent. The resulting curve accommodates the two sets of data ($r = 0.992$). It is concluded that the organic modifier in RP-HPLC exerts subtle effects on the retention behavior of pyridazinones, a discriminative feature which may also be important in biological membranes. (Author abstract by permission)

81-1488. VanDamme, J. C.; Galoux, M.; Verdier, J. (Stn. Phytopharm. Etat, B-5800 Gembloux, Belgium) **Methode de dosage par chromatographie liquide haute performance de l'ethylenethiouree dans les formulations a base d'ethylene-bis-dithiocarbamates. [Reversed-phase high-performance liquid chromatography determination of ethylenethiourea in ethylene-bis-dithiocarbamate formulations.]** *J. Chromatogr.* 206(1): 125-131; 1981 (8 references) (French).

The ethylenethiourea (ETU) contents of ethylene-bisdithiocarbamate formulations have been determined by

reverse-phase chromatography. The method is simple, rapid (25 min), and allows to control easily the analysis time in order to minimize the ETU formation from the intermediary degradation products in solutions. The analyzed products contain less than 0.2% ETU except for the more than 3 yr old formulations. Samples stored under normal conditions have shown an ETU increase of 30% to 80% after 2 yr. (Author abstract by permission)

81-1489. Skelly, N. E. (Anal. Lab., Dow Chem., Midland, MI 48640) **High-performance liquid chromatographic analysis of technical Ruelene insecticide.** *J. Chromatogr.* 206(1): 181-185; 1981 (6 references).

High-performance liquid chromatograms are presented for a Ruelene insecticide sample and standard. Ruelene contains the active ingredient, 4-tert-butyl-2-chlorophenyl methyl methylphosphoramidate (crufomate), and 2 significant impurities, 4-tert-butyl-2-chlorophenyl dimethyl phosphate (triester) and 4-tert-butyl-2-chlorophenyl *N,N'*-dimethylphosphorodiamidate (diamidate). Sample preparation consisted of weighing 20-30 mg 4-chlorophenol internal standard to the nearest 0.01 mg into a 4-dram vial. The Ruelene insecticide sample (40-60 mg) and 10 ml acetonitrile were then added. Twenty μl aliquots of the calibration solution were injected, until the response factor varied < 1% for consecutive injections. Duplicate aliquots (20 μl) of the sample solution were also injected. Peak areas were recorded on computing integrator, and the results were averaged. A wavelength of 270 nm was used to monitor the separation; it is similar to the wavelength of maximum absorption for crufomate and related impurities.

81-1490. Pande, S. P.; Pendharkar, A. V. (Natl. Environ. Eng. Res. Inst., Nagpur 440020, India) **Some analytical aspects of lead and cadmium determination in drinking water by atomic absorption spectrophotometry.** *J. Inst. Chem. (Calcutta)* 52(4): 141-144; 1980 (7 references).

A study was carried out on the possible interferences of various ions in the atomic absorption spectrophotometric determination of lead and cadmium in drinking water. A Shandon Southern model 3400 atomic absorption spectrophotometer equipped with direct absorbance readout and hollow cathode lamps for lead and cadmium was used. In general, low concentrations of ions have little effect on the absorption signal. However, calcium was found to interfere significantly with cadmium determination. It was found that the absorption signal of cadmium in the presence of calcium could be enhanced by the addition of an equivalent excess amount of aluminum ions. Tests were also carried out to determine the effect of various concentrations of nitric acid on the absorption signals of lead and cadmium. It was seen that the signals decreased slightly for solutions in 1 *N* HNO_3, and it was noted that the signal is maximal at 0.1 *N* nitric acid.

81-1491. Kosterov, V. M.; Ermakov, V. V. (All-Union Res. Inst. Chem. For., USSR) **Opredelenie piklorama v organakh i tkaniakh zhivotnykh. [Picloram determination in organs and tissues of animals.]** *Khim. Sel'sk. Khoz.* 18(10): 55-57; 1980 (14 references) (Russian).

A gas chromatographic determination method for the herbicide Tordon (picloram) in animal organs and tissues is described. The technique consisted of alkaline hydrolysis of the sample (homogenate of the liver, kidneys, muscle, lungs and heart), extraction of herbicide with diethyl ether, re-extraction with sodium bicarbonate, repeated extraction with organic solvent, and detection of ethyl ether. Alkaline hydrolysis of the sample was found to increase extraction of the herbicide. The sensitivity of the method was 0.1-0.2 mg/kg.

81-1492. Lehman, T. A.; Harvan, D. J.; Hass, J. R. (Lab. Environ. Chem., NIEHS, Research Triangle Park, NC 27709) **Bond breaking energy in collision induced dissociation: a study of carbon cage fragmentation in cubane, Kepone and mirex.** *Org. Mass Spectrom.* 15(9): 437-439; 1980 (21 references).

Collision induced dissociation of the carbon cage compounds cubane, Kepone (chlordecone) and mirex was examined. The dissociation of $[C_8H_8]^+$ mainly produced ions with 6 and 4 carbons. Five- and 3-carbon ions were produced in moderate abundance, and some 1- and 2-carbon ions were observed. Fragmentation of the molecular ions in Kepone and mirex gave fragments down to $[C_5Cl_5]^+$. The energy available for bond breaking was not less than about 9 eV.

81-1493. Galoux, M.; VanDamme, J. C.; Bernes, A. (State Phytopharmacol. Stn., C.R.A., B-5800 Gembloux, Belgium) **Determination of bioallethrin, bioresmethrin and piperonyl butoxide in spray formulations.** *Parasitica* 35(2): 84-89; 1979 (7 references).

An analytical method is presented for determination of the synthetic pyrethroids bioallethrin and bioresmethrin, and the synergist piperonyl butoxide, in aerosol formulations. Bioresmethrin is separated from piperonyl butoxide by column chromatography. The separation is necessary because bioresmethrin and piperonyl butoxide have very similar retention times. Gas chromatographic determination is performed after cleanup on an aluminum oxide column. Replicate determinations are carried out using 2 μl of sample solution. Injection of 2 μl of standard is performed before each sample injection for calibration. Recoveries are 99.9% for bioallethrin, 99.8% for bioresmethrin and 100.1% for piperonyl butoxide.

81-1494. Nazimek, T.; Szucki, B. (Dep. Toxic Chem., Inst. Pract. Med. & Hyg, Lublin, Poland) **Badania adsorp-**

cji par dichlorfosu na weglu aktywnym metoda impulsowa. [Studies of the adsorption of dichlorvos vapor on activated carbon by the impulse method.] *Przem. Chem.* 59(10): 548-550; 1980 (8 references) (Polish).

Studies of DDVP (dichlorvos) adsorption on activated carbon with a total area of 1177 m^2/g were made. The gas chromatography method was used in these studies. Measurements of the static adsorption were carried out at two temperatures, 290°K and 295°K, to determine the influence of temperature changes on adsorption as well as adsorption rate. The impulse adsorption studies were carried out at temperatures of 333°, 343°, 353°, and 363°K. Analysis of the results of the static adsorption of dichlorvos on carbon indicates a strong dependence of this process on temperature changes. It was found that activation adsorption exists in addition to physical adsorption. The presence of activation adsorption makes the desorption of DDVP from activated carbon more difficult, and can be a cause of large analytical errors. The process for regeneration of the activated carbon should be carried out at high temperatures (above 413-423°K) in an oxygen atmosphere in order to obtain the full desorption of chemisorbed DDVP.

81-1495. Chiosi, S.; DiCostanzo, R.; Montagna, O.; Radnazzo, G. (Inst. Org. Chem. & Biol., Univ. Naples, Naples, Italy) **L'uso della cromatografia ad alta pressione nell'analisi degli inquinanti cloroorganici. [Use of high performance liquid chromatography in the analysis of chlorine containing organic pollutants.]** *Rend. Accad. Sci. Fis. Mat. Naples* 45: 71-77; 1979 (21 references) (Italian).

Plant and animal tissues were analyzed for organochlorine pesticide residues by HPLC. Differentiation between PCBs and DDEs was not possible because of similar retention times. DDEs were then converted to benzophenone derivatives by dehydrohalogenation and oxidation; these procedures did not affect the PCBs. HPLC was performed again; separation of PCBs and the benzophenone derivatives of DDE was achieved. Analysis of the PCB + benzophenone mixture by gas chromatography was unsuccessful because the retention times for PCBs and the benzophenone derivatives of DDE were the same.

81-1496. Potrzebnicka, K.; Cwiertniewska, E. (Dep. Food Res. & Objective Use, State Inst. Hyg., PL-00791 Warsaw, Poland) **Metoda oznaczania pozostalosci hydrazydu maleinowego w ziemniakach. [A method for determining maleic hydrazide residues in potatoes.]** *Rocz. Panstw. Zakl. Hig.* 31(5): 465-469; 1980 (12 references) (Polish).

A spectrophotometric method for the quantitative determination of residues of the herbicide maleic hydrazide (MH) in potatoes is presented. Granulated or powdered zinc was used as a reducing agent for MH in a concentrated NaOH solution at 173°C. The hydrazine obtained was then removed by distillation with nitrogen and bound in acid medium to *p*-dimethylaminobenzoic aldehyde. The yellow complex resulting from this reaction was determined in a spectrophotometer at 430, 460 and 490 nm. The recovery rates from samples fortified with 7.5, 15.0 and 25.0 mg/kg MH (using granulated and powdered zinc) were 94.3 and 103.3%, 75.4 and 82.9%, and 81.6 and 103.5%, respectively. The detection threshold of the method was 1.5 mg/kg. Marketed potatoes used as a control generally did not show absorbance; in some cases, traces of MH were found.

81-1497. Uno, M.; Onji, Y.; Okada, T.; Ohmae, T.; Nishikawa, Y. (Nara Prefect. Inst. Public Health, Nara, Japan) **[Determination of ethylene thiourea residues by *m*-trifluoromethylbenzyl derivatization.]** *Shokuhin Eiseigaku Zasshi (J. Food Hyg. Soc. Jpn.)* 21(5): 386-389; 1980 (6 references) (Japanese).

Gas-liquid chromatography with flame photometric detection was used to determine residues of ethylene thiourea (ETU) in agricultural crop samples. Samples were extracted with ethanol and the extract was converted to the *S*-(*m*-trifluoromethylbenzyl) derivative. The derivatized extract was cleaned up with ethyl ether and the product was then subjected to *N*-methane-sulfonylation under basic conditions. The resulting derivative [2-(*m*-trifluoromethyl) benzyl thio-1-methanesulfonyl 2-imidazoline] was then determined by GLC. The detection limit was 0.01 ppm. Average recoveries were 89.0% for 15 agricultural products fortified at 0.2 ppm. The final product was stable at room temperatures for 1 mo.

81-1498. Malinin, O. A. (Ukrainian Res. Inst. Exp. Vet. Sci., USSR) **Opredelenie khloroorganicheskikh i nekotorykh fosfororganicheskikh pestitidov. [Determination of organochlorine and certain organophosphorus pesticides.]** *Veterinariya (Moscow)* (11): 62-64; 1980 (Russian).

A method of extraction and purification of biological samples for determination of organochlorine and organophosphorus pesticides is described. Extractions of pesticides from vegetables, green plants, grain, forage, hay, animal tissues, butter, fats, drinking water and urine were carried out with acetone. The purified extract was analyzed by gas or thin layer chromatography. Detectability was 81.1 ± 9.7% for HCCH (HCH, BHC); 71.2 ± 9.5% for heptachlor; 72.9 ± 9.0% for Kelthane (dicofol); 77.1 ± 9.2% for DDT; 73.2 ± 10.4% for DDE; 69.3 ± 8.7% for Dilor; 76.6 ± 10.1% for Dibrom (naled); and 75.3 ± 10.2% for bromophos.

81-1499. Shustrov, V. S.; Zelenina, M. F.; Kulintsova, E. V. (Lab. Dev. Methods Pestic. Anal., All-Russian Res.

Inst. Plant Prot., Voronezh, USSR) **Opredelenie gerbitsida lenatsila v rastitel'nom materiale i zerne metodom khromatografii v tonkom sloe. [Thin layer chromatographic determination of the herbicide lenacil in plant samples and grain.]** *Vopr. Pitan.* (6): 70-71; 1980 (2 references) (Russian).

Thin layer chromatographic determination of the herbicide lenacil in grain and green plant parts was developed. The method is specific for lenacil. Other herbicides [sodium trichloroacetate (sodium TCA) and Pyramine (pyrazon; chloridazon)] do not hinder the determination. The method is based upon the extraction with chloroform, distillation of the solvent, purification of the extract and thin layer silica gel chromatography. Sensitivity of the method was 5 μg/sample.

81-1500. Chmil', V. D. (All-Union Res. Inst. Hyg. & Toxicol. Pestic. Polym. & Plast., Kiev, USSR) **Opredelenie pestitsidov v vozdukhe. Kontsentrirovanie parov pestitsidov etilenglikolem. [Determination of pesticides in the air. Concentration of pesticide vapors with ethylene glycol.]** *Zh. Anal. Khim.* 35(10): 2049-2051; 1980 (12 references) (Russian).

The use of ethylene glycol for concentration of pesticide vapors is described. Air containing 2,4-D, 2,4-D butyl ester, 2,4-DCP (a degradation product of 2,4-D), and DDE vapors was passed through 4 consecutive absorbers holding 10 ml of ethylene glycol. The first absorber was found to contain 87-95% of the introduced pesticide. The fourth absorber did not contain any pesticide. These results indicate that 2 absorbers are sufficient for the concentration of pesticide vapors.

See also 81-1213, 81-1228, 81-1240, 81-1242, 81-1286, 81-1305, 81-1306 *and* 81-1307.

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